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VOLUME 41 November 10, 1952 NUMBER 23

ETHYLENE OXIDE DERIVATIVES AND THEIR USES IN THE TEXTILE INDUSTRY*

GIUSEPPE TRINCHIERI

Translated by
DINO COLLODEL
Royce Chemical Co

INTRODUCTION

ETHYLENE oxide is a chemical product which, in the past decade, has assumed increasing importance in the manufacture of textile chemicals. It is the raw material for the production of ethanolamines, solvents, polyglycols, and of the most important series of nonionic surface-active-agents.

Ethylene oxide can be manufactured at a low cost, since ethylene, the base from which it is made, is a byproduct of coke manufacture.

Discovered by Wurtz about 100 years ago ethylene oxide *(1)*, is produced by converting ethylene into ethylene chlorohydrin followed by saponification of the latter with lime; it can also be made by direct oxidation of ethylene. It is a colorless liquid, possessing a characteristic ethereal odor, having a specific gravity of 0.8711 at 20°C/20°C, and a boiling point of 10.7°C (760 mm). It is toxic and very explosive in the gaseous state. In the presence of alkaline catalysts, it has the property of reacting readily with compounds containing particularly reactive groups, such as hydroxyl, carboxyl and amino groups, etc. Once initiated and catalyzed, the reaction of such compounds with ethylene oxide appears to be self-sustaining and highly exothermic.

It is not feasible to go into technical details; suffice to say that it is possible to obtain many important products by the reaction of ethylene oxide with water, hydrogen sulfide, phenols, mercaptans, alcohols, amines and other compounds.

The products which are of principal interest to the textile industry are listed in Table I.

* Reprinted from *Tinctoria*.

PROPERTIES AND APPLICATIONS

For the purposes of this article it is well to subdivide the derivatives of ethylene oxide into two categories:

(A) derivatives having no surface-active properties

(B) derivatives having surface-active properties

(A) DERIVATIVES HAVING NO SURFACE ACTIVE PROPERTIES

GLYCOLS AND POLYGLYCOLS—— Ethylene oxide reacting with water forms ethylene glycol, which can react with another molecule of ethylene oxide to give diethylene glycol; still another added molecule of ethylene oxide produces triethylene glycol and condensation with several molecules of ethylene oxide gives polyglycols of the general formula HO. $CH_2(CH_2.O.CH_2)$ x CH_2OH. Polyethylene glycols can be obtained by condensing ethylene oxide with ethylene glycol or diethylene glycol. Polyethylene glycols of medium molecular weight, between 200 and 700, are liquids, those having molecular weights higher than 1000, solids. The glycols and polyethylene glycols are used in the textile industry as glycerin substitutes, water-soluble lubricants, conditioning, antistatic and finishing agents for yarns and as pasting, solubilizing and dispersing agents for coloring matters in dyeing.

ETHANOLAMINES AND ALKYL ETHANOLAMINES OF LOW MOLECULAR WEIGHT——This class includes mono-, di- and triethanolamine, substances dissolving easily in water and giving a weakly alkaline reaction. The last named, which, in its commercial form, consists of a mixture of mono-, di- and triethanolamine (the last predominating), is extensively used as a mild alkali in the manufacture of soaps, emulsifiers and textile softeners.

Having a certain amount of interest to the textile industry are those alkyl ethanolamines obtained by the reaction of ethylene oxide on alkylamines of low molecular weight, such as methylamine and ethylamine, which are used in certain processes as mild alkalies on account of their particular physical characteristics (see Table II) and for the manufacture of soaps and antistatic finishing agents.

ALCOHOL ETHERS OF LOW MOLECULAR WEIGHT——These products, obtained by the action of ethylene oxide on alcohols and phenols of low molecular weight, are used as solvents and wetting agents in certain operations.

Among these compounds we may mention ethyl glycol, butyl glycol and the hydroxyethyl compounds of phenol and the xylenols.

The physical characteristics of a few alcohol ethers are shown in Table III.

(B) DERIVATIVES HAVING SURFACE-ACTIVE PROPERTIES

By condensing ethylene oxide with acids, alcohols, amines, phenols and amides of high molecular weight, it is possible to obtain very interesting surface-active prod-

TABLE I

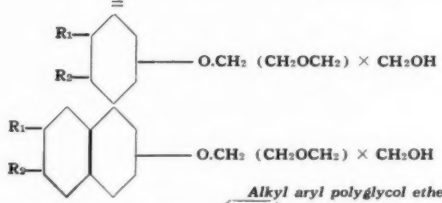
$H_2O + (CH_2)_2O$ = $HO.CH_2.CH_2OH$
ethylene glycol

$H_2S + (CH_2)_2O$ = $HOCH_2CH_2.S.CH_2CH_2OH$
thiodiglycol

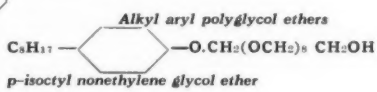
Ethylene glycol + $(CH_2)_2O$ = $HOCH_2CH_2OCH_2CH_2OH$
diethylene glycol
$HOCH_2CH_2OCH_2.CH_2OCH_2CH_2OH$
triethylene glycol
$HOCH_2\ (CH_2OCH_2) \times CH_2OH$
polyethylene glycol

Aliphatic alcohols + $(CH_2)_2O$ = $C_4H_9.OCH_2CH_2OH$
butyl ethylene glycol ether
$R.O.CH_2\ (CH_2OCH_2) \times CH_2OH$
alkyl thiopolyethyleneglycol ethers
$C_{12}H_{25}.S.CH_2\ (CH_2OCH_2)_{10}\ CH_2OH$
lauryl thiodecaethylene glycol ether

Alkyl phenols or Alkyl naphthols + $(CH_2)_2O$ =

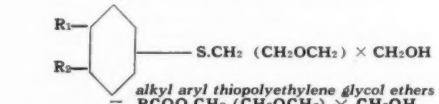


Alkyl aryl polyglycol ethers

Example: 

p-isoctyl nonethylene glycol ether

Alkyl thiophenols + $(CH_2)_2O$ =

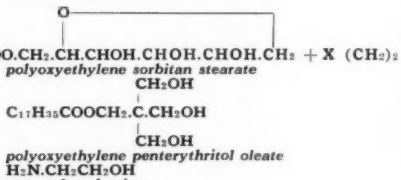


alkyl aryl thiopolyethylene glycol ethers

Aliphatic acids + $(CH_2)_2O$ = $RCOO.CH_2\ (CH_2OCH_2) \times CH_2OH$

Example: $C_{17}H_{35}COO.CH_2\ (CH_2OCH_2)_5\ CH_2OH$
hexaethylene glycol stearate

Aliphatic acid esters of polyalcohols + $(CH_2)_2O$ =



polyoxyethylene sorbitan stearate

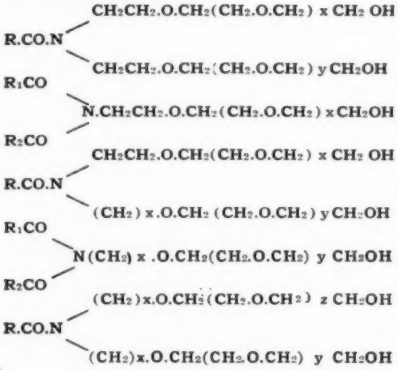
polyoxyethylene penterythritol oleate

$NH_3 + (CH_2)_2O$ = $H_2N.CH_2CH_2OH$
monoethanolamine
$NH(CH_2CH_2OH)_2$
diethanolamine
$N(CH_2CH_2OH)_3$
triethanolamine

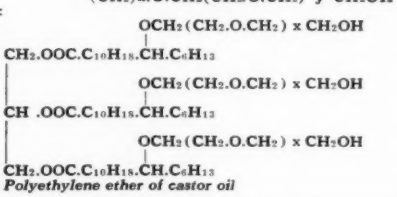
Alkylamines + $(CH_2)_2O$ = *Alkylethanolamines*

Examples: C_2H_5
$N.CH_2CH_2OH$
C_2H_5
diethylethanolamine
$C_{18}H_{37}.NH.CH_2\ (CH_2.O.CH_2)_5\ CH_2OH$
stearylaminoglycol ether

Alkylolamides of aliphatic acids + $(CH_2)_2O$ =



Glycerides of aliphatic hydroxyacids + $(CH_2)O_2$ =



Polyethylene ether of castor oil

ucts in which the solubilizing group is not of the saline type as the —COONa, as in soap or the —SO_4Na as in the fatty alcohol sulfonates, but a long nonionizable chain,

$CH_2CH_2O.CH_2CH_2O \ldots\ldots CH_2CH_2OH.$

This class of surface active products may be represented by the general formula: $R.O.(CH_2CH_2O) \times H$ (1), in which R represents an alkyl, alkylaryl, acyl, alkylamido or other group of high molecular weight (see Table I). R must contain an alkyl chain having at least eight carbon atoms.

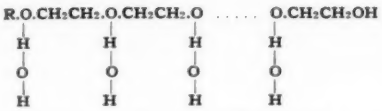
By variation in formula (1) of the length of the aliphatic chain represented by R, that is, by increasing the number of carbon atoms contained in it, or by varying the number x of the ethylene oxide groups, i e, the degree of condensation, as can be seen, it is possible to obtain an infinite number of different molecular combinations.

The solubility of these compounds depends not only on the number of carbon atoms contained in the aliphatic chain, but also on the degree of condensation. The higher the molecular weight of the group R, the higher must be the number of ethylene oxide groups to produce good water solubility. If two R groups are analogous and have the same molecular weight, but one of them has a saturated aliphatic chain and the other an unsaturated aliphatic chain, the latter will require a lower number of ethylene oxide groups to obtain the same degree of solubility in water.

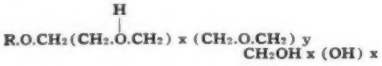
If, for a given group R, the number x of the ethylene oxide groups is not sufficiently great, a product is obtained which is not soluble but dispersible in water; as the degree of condensation x is progressively increased, products are obtained that are increasingly soluble and finally a compound is produced that is soluble in water, forming a clear solution.

If the number of the ethylene oxide group is such that the product gives clear solutions in water (x from 7 to 10), turbidity develops on heating the solution, due to separation of the substance. The temperature at which turbidity appears is dependent on the degree of condensation x. If this is very high, compounds are produced whose solutions in distilled water do not develop any turbidity, even on boiling. It is important to note that the point at which turbidity appears is lowered by the presence of acids or salts in the solution.

According to Chwala, the solubility in water of the surface active substances of the type under consideration is accompanied by the formation of products having additional water molecules attached to the atoms of oxygen in the ether radical because of the residual valency forces, giving oxonium derivatives:



More recently, Wurzschmitt (2) has stated that oxonium compounds are not formed in water solutions of the polythylene ethers, but polyoxonium derivatives having cationic properties:



Wurzschmitt bases his opinion on the fact that surface active derivatives of ethylene oxide behave toward some reagents as cationic compounds. It is a matter of fact that condensation products of ethylene oxide can be precipitated or neutralized with certain anion-active compounds under certain conditions, in exactly the same way as true cation-active compounds.

On heating aqueous solutions of ethylene oxide condensation products, temporary scission of the oxonium or polyoxonium derivatives occurs, giving rise to turbidity of the solutions. This reaction is reversible and, on cooling, the solution becomes clear again.

The relation between the part having an affinity for fats (R in formula 1) and the part having an affinity for water (the polyethylene oxide chain) is important in determining the properties of the compound. In general, products with a relatively low x, that is to say, with a rather short ethylene oxide chain, are soluble in oils (and dispersible in water) and constitute good oil-soluble emulsifying agents. Products having ethylene oxide chains of medium length are good detergents and wetting agents for wool goods, while those of high molecular weight are good dispersing and emulsifying agents for fatty acids and waxes, scouring agents for raw wool and leveling agents for use in dyeing.

Regarding the fatty and hydrophobic materials used in making surface-active agents by condensation with ethylene oxide, it may be said that, using starting materials of analogous type, it is possible to produce sufficiently similar products by suitable variation of the quantity of ethylene oxide.

For this reason we will not subdivide the surface-active agents according to the fatty or hydrophobic matters used in making them, but according to their use in the textile industry.

I. OIL SOLUBLE EMULSIFYING AGENTS

Animal, vegetable and mineral oils are widely used in the textile industry in such operations as spinning, garnetting of wool waste, also in carding and spinning new fibers. They are used because of their lubricating and cohesive action in these operations. In the wool industry the most commonly used lubricants are olive- and mineral oils in combing and olein in carding. In the cotton industry, castor oil is used, and in manufacturing rayon and natural silk, mineral oil or vaseline. In order to accomplish the maximum dispersion of the oil in the materials, it is applied, for the most part, in the form of an oil-in-water emulsion. For this purpose it is emulsified in several times its weight of water. In the past, the emulsifying agents used were ammonia-olein and triethanolamine-olein soaps, sulfonated oils and sulfonated alcohols (3).

These emulsifying agents have been almost completely superseded by the more modern oil-soluble polyoxyethylene emulsifiers because they are easier to use, they are stable to hard water, they give more finely divided dispersions, they have good lubricating properties, they make the oil more easily removable from the fiber and in addition, they have antistatic properties.

Products with a relatively short polyoxyethylene chain belong to this category of emulsifiers; they are the condensation products of alcohols, fatty acids and alkylphenols, etc, with 4-8 molecules of ethylene oxide. To obtain good oil-in-water emulsions it is necessary that equilibrium between the fatty part (hydrophobic) and the polyoxyethylene chain be well controlled. If the number of ethylene oxide molecules is too small the product is very soluble in oil and not very soluble in water and, on this account, tends to form water-in-oil emulsions. On the other hand, if the length of the ethylene oxide chain (hydrophylic) is increased, the product becomes more soluble in water and less soluble in oil and is apt to produce oil-in-water emulsions.

TABLE II
PHYSICAL CHARACTERISTICS OF ETHANOLAMINES AND ALKYL ETHANOLAMINES

Name	*Formula*	*M W*	*B P*	*Solubility in water*
Monoethanolamine	$HOCH_2CH_2NH_2$	61.08	170.5	complete
Diethanolamine	$(HOCH_2CH_2)_2NH$	105.14	269.1	95.4%
Triethanolamine	$(HOCH_2CH_2)_3N$	149.19	360	complete
Dimethylethanolamine	$(CH_3)_2NCH_2CH_2OH$	89.14	133.5	"
Methyldiethanolamine	$CH_3N(CH_2CH_2OH)_2$	119.16	217.2	"
Diethylethanolamine	$(C_2H_5)_2NCH_2CH_2OH$	117.19	162.1	"
Aminoethylethanolamine	$NH_2C_2H_4NHC_2H_4OH$	104.15	243.7	"

Thus, a condensation product of isooctylphenol with 4 molecules of ethylene oxide (slightly soluble in water, very soluble in oil), gives water-in-oil emulsions. By suitably increasing the number of molecules of ethylene oxide, it is possible to obtain emulsifiers which produce oil-in-water emulsions.

The emulsifying properties of the products under discussion are affected by change of temperature. The solubility in oil of those emulsifiers that are oil soluble increases with rise in temperature, while, at the same time, their water solubility decreases, with the result that oil-in-water emulsions prepared with them in the cold are converted into water-in-oil emulsions on heating and when the temperature is unduly high oil separates from the emulsions.

The oxyethylene emulsifiers of low degree of condensation are dispersible in water and soluble in mineral oils and neutral glycerides (olive oil and peanut oils, etc). If the solutions of the emulsifiers in oils are turbid, it is necessary to clear them by adding a small quantity of water (this is often all that is necessary) or water and oleic acid or water and cyclohexanol (hexaline). Complete solubilization is indispensable as solutions which are not clarified produce cation-active emulsions.

The above mentioned emulsifying agents are not suitable for making emulsions of oleic or other fatty acids, but products containing higher ethylene oxide content can be used. For this purpose condensation products of fatty alcohols with 15-25 molecules of ethylene oxide or of castor oil with 40 molecules of ethylene oxide appropriate. A typical product of the last named type has the following formula:

TABLE III
PROPERTIES OF SOME ALCOHOL ETHERS OBTAINED BY CONDENSATION OF ALCOHOLS AND PHENOLS WITH ETHYLENE OXIDE

Name	*Formula*	*M W*	*B P*	*Solubility in water*
Methylglycol	$CH_3O.CH_2CH_2OH$	76.09	124.5	complete
Ethylglycol	$C_2H_5O.CH_2CH_2OH$	90.12	135.1	"
Butylglycol	$C_4H_9O.CH_2CH_2OH$	118.17	171.2	"
Phenylglycol	$C_6H_5O.CH_2CH_2OH$	138.16	244.7	2.4%
Methyldiglycol	$CH_3O.(CH_2CH_2OH)_2$	120.15	194.2	"
Ethyldiglycol	$C_2H_5O.(CH_2CH_2OH)_2$	134.17	195.0	"
Butyldiglycol	$C_4H_9O.(CH_2CH_2OH)_2$	161.22	230.4	"

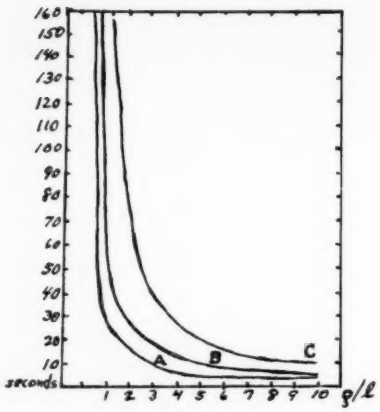


Figure 1

Wetting power of product A in distilled water at 17°C (Curve A) compares with condensation products of the same fatty base with varying amounts of ethylene oxide (Curves B and C).

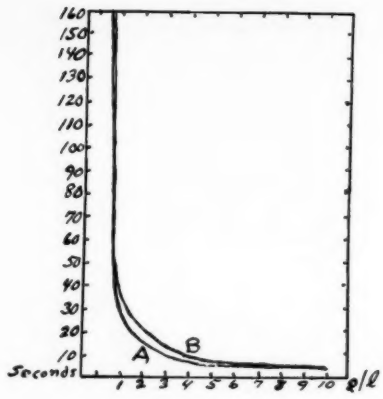


Figure 2

Wetting Power of Product A in distilled water (A) and in hard water (B)

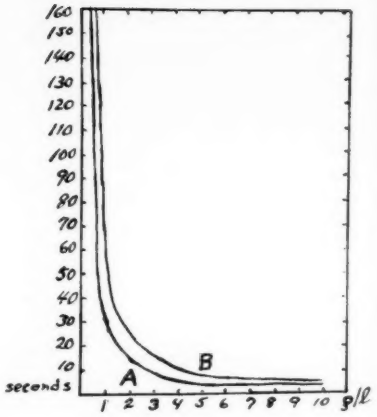
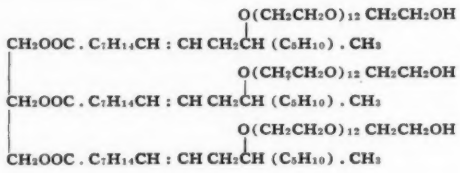


Figure 3

Wetting power of Product A in distilled water (A) and in a 5% solution of sulfuric acid (B)


O(CH2CH2O)12 CH2CH2OH
CH2OOC . C7H14CH : CH CH2CH (C8H10) . CH3
O(CH2CH2O)12 CH2CH2OH
CH2OOC . C7H14CH : CH CH2CH (C8H10) . CH3
O(CH2CH2O)12 CH2CH2OH
CH2OOC . C7H14CH : CH CH2CH (C8H10) . CH3

3 - 5% of such emulsifier is enough to produce good emulsions. It is much easier to emulsify oleic acid well with these emulsifying agents than with ammonia or with triethanolamine. They work equally well in soft or hard water. Cold water should be used in making the emulsions.

2. WETTING AGENTS AND DETERGENTS

Condensation products of fatty acids, alcohols, amines and amides of high molecular weight with 6 - 15 molesules of ethylene oxide are substances endowed with good wetting and detergent properties. These properties are dependent partly on the nature of the fatty body and partly on the quantity of ethylene oxide used (degree of condensation).

Figure 1 shows the wetting power of Product A as compared with two other products made from the same fatty base with varying quantities of ethylene oxide. Figure 1 clearly shows the importance of using just the correct proportion of ethylene oxide with a given amount of any given fatty body to produce a product having maximum wetting power. These experiments give fairly accurate results.

The wetting power was determined by measuring the sinking time of small discs of very tightly woven cotton fabric 2.5 cm in diameter weighing about 4 grams. The fabric used was Tessuto TM made by Filli Testori SpA, di Novate Milanese.

The relation between the fatty substance and the length of the ethylene oxide chain affects the degree of detergent power. This is shown in Table IV in which are recorded the results of scouring tests on wool with Product A and the same two products which were tested for wetting power and recorded in Figure 1.

From this it is clearly seen that, in washing wool at 45 - 50°C, an excessively long ethylene oxide chain does not improve detergent power.

The detergency test was made by weighing samples of woolen cloth artificially soiled with 5% fats consisting of 90% vegetable oil and 10% mineral oil, treating them as shown in table 5 with the nonionic detergents named. For the sake of comparison, a sample of the same soiled cloth was treated with a good soap containing 65% fatty acids. This shows that, without any addition of alkali, which is the optimum condition for preservation of the protein fiber, the detergent power of Product A is superior to that of a good conventional soap.

The good wetting and detergent properties of ethylene oxide condensation products are very little affected by hard water, acids, bases, hydrogen peroxide, etc as shown in Figures 2 and 3, which illustrate the wetting power of Product A in distilled water, hard water and in a 5% solution of sulfuric acid.

The detergent power of these products is only slightly affected by the presence of calcium salts, as is shown in Table V, in which are given the results of detergency tests made on the same artificially soiled woolen fabric with Product A in soft water and in water containing 350ppm hardness. For purposes of comparison samples were also scoured with soap containing 65% fatty acid.

While the detergency of Product A is hardly affected at all by the presence of calcium salts, that of soap is practically nullified.

Another important property of the polyethylene oxide detergents and wetting agents is their power of inhibiting the precipitation of lime soaps. When hard water is added to a solution of soap in distilled water, if the hard water is added a little at a time, the solution becomes opalescent without any flocculent precipitation of lime soap. This is because the lime salts in the added hard water convert only part of the alkaline soap in the solution into lime soap, the excess of soap in the solution acts as a colloid protective agent and holds the lime soap in suspension. On addition of more hard water all the soap is converted into lime soap which forms a flocculent precipitate.

TABLE IV

RESIDUAL FATTY MATTER IN WOOLEN CLOTH, WHICH ORIGINALLY CONTAINED 5% FAT, AFTER WASHING WITH THREE DETERGENTS IN SOFT WATER AT 40-50°C FOR 30 MINUTES

% Residual fat	*Detergent 5 g per l*
0.45	Product A
0.60	Condensate B
1.50	Condensate C
1.40	Sodium soap (65% fatty acids)

(Continued on Page 751)

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November 10, 1952

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ADR AWARD WINNERS ANNOUNCED

WINNERS of the second annual AMERICAN DYESTUFF REPORTER AWARD, as announced by Percival Theel at the Annual Banquet on November 8th, are C G Lyle, J J Iannarone and R J Thomas for their paper "High Temperature Dyeing of New Synthetic Fibers", which appeared on page P585, Volume 40.

Judges for the 1952 Award were Halold M Chase, Consultant, *Chairman;* Ethel L Phelps, School of Home Economics, University of Minnesota; and John N Dalton, Pacific Mills Worsted Division.

Biographical sketches of the authors and other details will follow in a later issue.

CALENDAR

AATCC

COUNCIL

Jan 16, 1953; April 17, 1953; June 5, 1953.

GENERAL RESEARCH COMMITTEE

(See Council dates)

NATIONAL CONVENTIONS

September 17-19, 1953 (Hotel Conrad Hilton, Chicago); 1954 (Atlanta, Ga); Sept 21-23, 1955 (Chalfonte-Haddon Hall, Atlantic City, N J).

HUDSON-MOHAWK SECTION

December 5, February 6, March 20, May 8 (Albany); June 19 (Outing).

MID-WEST SECTION

February 14 (Hotel Bismarck, Chicago, Ill); April 18 (Netherland Plaza, Cincinnati, O); June 20 (Outing, Lake Delavan, Wis); November 7, 1953 (Hotel Bismarck).

NEW YORK SECTION

November 21 (Kohler's Swiss Chalet, Rochelle Park, N J); January 30, February 27 (Hotel Statler, New York, N Y); April 17, May 22 (Swiss Chalet).

NORTHERN NEW ENGLAND SECTION

December 6 (Annual Meeting, Lowell Textile Institute).

PHILADELPHIA SECTION

Dec 5, Jan 16 (Kugler's Restaurant).

RHODE ISLAND SECTION

December 5 (Annual Meeting, Sheraton-Biltmore, Providence, R I).

SOUTH CENTRAL SECTION

December 6 (Patten Hotel).

WESTERN NEW ENGLAND SECTION

Nov 14 and Dec 12 (Rapp's Restaurant, Shelton, Conn).

OTHER EVENTS

AMERICAN ASSOCIATION OF TEXTILE TECHNOLOGISTS

2nd Annual Symposium, Feb 3, Hotel Statler, New York.

AMERICAN SOCIETY FOR TESTING MATERIALS

1953 Annual Meeting, June 29-July 3, Chalfonte-Haddon Hall, Atlantic City, N J.

AMERICAN STANDARDS ASSOCIATION

34th Annual Meeting, November 25, Waldorf-Astoria, New York, N Y.

ISO—TC 38 (Textiles)—SC-1 (Color Fastness), Nov 10-11 (ASA Headquarters, New York, N Y).

AMERICAN TEXTILE MACHINERY ASSOCIATION

Exhibit of American Textile Machinery, April 26-May 1, 1954, Atlantic City Exhibition Hall, Atlantic City, N J.

CANADIAN ASSOCIATION OF TEXTILE COLOURISTS AND CHEMISTS (Quebec Section)

Nov 15, Dec 13, Jan 17, Feb 21, Mar 21 (Physical Science Centre, McGill Univ, Montreal, Que); April 17-18 (Annual Meeting, Mount Royal Hotel, Montreal, Que); June 20 (Annual Golf Tournament).

NATIONAL ASSOCIATION OF HOSIERY MANUFACTURERS

41st Knitting Arts Exhibition, April 27-May 1, 1953, Atlantic City Auditorium, Atlantic City, N J.

NATIONAL COTTON COUNCIL

4th Annual Cotton Research Clinic, Feb 18-20, Oglethorpe Hotel, Savannah, Ga.

NEW YORK BOARD OF TRADE (DCAT)

27th Annual Drug, Chemical and Allied Trades Dinner, March 5 (1953), Waldorf-Astoria, New York, N Y.

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES

Nov 12, Dec 3 (Annual Meeting), Jan 14, Feb 11, March 11——all at the Hotel Commodore, New York; June 11-13 (Joint Outing with Manufacturing Chemists' Association at The Greenbrier, White Sulfur Springs, W Va.

TEXTILE RESEARCH INSTITUTE

23rd Annual Meeting, Nov. 17-18, Hotel Commodore, New York, N Y.

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

52-21

Education: B S Chemistry, Mass Inst Tech.
Experience: Textile Chemist, plant and research.
Age: 60; married; references; North Atlantic Coast preferred.

10-27, 11-10

52-22

Education: High school and Lowell Evening Textile
Experience: Foreman, finishing of cotton and synthetics.
Age: 47; married; references; New England preferred but not essential.

10-27, 11-10

52-23

Education: Chemical Engineer with graduate and textile training.
Experience: Textile Chemist, Dyer and Finisher.
Age: 49; married; references.

10-27, 11-10

52-24

Education: High school.
Experience: Boss Finisher and Superintendent.
Age: 39; married; references; New England preferred but not essential.

10-27, 11-10

52-25

Education: B S Chemistry, with evening courses in textile chemistry and dyeing.
Experience: Chemist, print works.
Age: 27; married; references; northeast U S preferred.

10-27, 11-10

52-26

Education: B S, Chemical Engineering.
Experience: Dyer, synthetics and cotton.
Age: 25; single; references.

10-27, 11-10

52-30

Education: B T C, Lowell Textile Institute.
Experience: Mill Chemist.
Age: 30; married; references; northeastern U S preferred.

11-10, 11-24

52-31

Education: B S, textile dyeing and finishing, with further college studies in chemistry.
Experience: assistant in textile application and organic chemical research.
Age: 24; married; references; position as assistant dyer or textile chemist desired; north Atlantic coast preferred.

11-10, 11-24

ONE HUNDRED AND EIGHTY-THIRD COUNCIL MEETING

THE Council held its 183rd meeting at the Philadelphia Textile Institute in Philadelphia, Pa, on Friday morning, September 12, 1952. Present were President C Norris Rabold, *presiding;* Arthur T Brainerd, Arthur W Etchells, Samuel L Hayes and Raymond W Jacoby, Vice Presidents; Albert E Sampson, Assistant Treasurer; Leonard S Little, Chairman of the Research Committee; William D Appel, Carl Z Draves, Thomas R Smith and P J Wood, Past Presidents; Edward B Bell, John M Gould and Frank J O'Neil representing Northern New England; Alden D Nute representing Rhode Island; J Edward Lynn representing Western New England; Carl H Brubaker, Charles W Dorn, Herman E Hager, Weldon G Helmus, Paul J Luck and Henry L Young representing New York; Jack Epelberg representing Hudson-Mohawk; James Dixon, A E Raimo, Ernest E Rettberg, Jr, Richard B Stehle, S Graeme Turnbull, Jr and Jackson A Woodruff representing Philadelphia; C Russell Gill and H Gillespie Smith representing Southeast; Glenn R Bellamy representing South Central; Joseph H Jones representing Mid-West; Kenneth H Barnard and George O Linberg of the Conventions Committee; George L Baxter of the Corporate Membership Committee; Bertrand W Hayward and Richard S Cox of the Philadelphia Textile Institute; William A Holst, Jr of the Committee on Constitution and Bylaws; George H Schuler and Glenn D Jackson, Jr of the Publicity Committee; Percival Theel of the Publications Committee; J Robert Bonnar, Duncan G Carmichael, George H Hotte, Harry L Mercer and Harold C Chapin, Secretary.

The Secretary's report of the 182nd Council meeting and financial report of August 1st were accepted.

A plan for subscriptions to the *Colour Index,* with payments in advance of its publication early in 1956, was received from the Society of Dyers and Colourists. This was approved in principle but referred back to the Society with suggestions for modification in detail. Because the collection of material for the book in this country would be completed in September, Mr Cady offered his resignation as Co-ordinator. On recommendation of the Publications Committee this was not accepted, but until other work on the book should be resumed, the Committee was authorized to employ him on *Year Book* and other editorial work.

Professor Theel reported that Year Books were in process of mailing. Reprints of Part III, on Test Methods, had been made, and could be purchased from the Secretary at one dollar each. The official methods of the Swiss society had been translated by Dr Draves for publication in the *Reporter,* and reprints would be made. A printer for the Vat Dyeing monograph had been chosen and the work would soon be started. The pamphlet on Dyehouse Mathematics also would be printed soon. The paper to receive the American Dyestuff Reporter Award of this year would be chosen by the committee which last year had only screened papers for the Publications Committee.

For the Publicity Committee, Mr Schuler reported widespread interest in publicity for the Olney Medal Award, and plans for supplying copies of convention papers to the press.

Mr Baxter outlined a program through which his committee hoped to collect about a third more in Corporate dues for the support of research, particularly from companies now represented only by personal memberships. A list of Corporate members mimeographed and distributed at a recent New York Section meeting had seemed to stimulate interest among those whose companies were not represented.

For the Research Committee Mr Little reported that there would be further I S O meetings in New York, following the Boston convention. A new committee had been organized to study relations between finishes and the effect of abrasion. Conferences were under way with the American Institute of laundering toward agreement on fastness tests. An appropriation supplementary to the budget was requested for an assistant director of research, and was voted subject to the approval of the Appropriations Committee. Mr Little submitted his resignation as Chairman of the Research Committee, which the Council accepted with a resolution of thanks for his administration of that office and appreciation of his willingness to continue as Chairman of the Executive Committee on Research. Mr Dorn was elected Chairman of the Research Committee.

Mr Barnard reported for the Committee on Conventions and Mr Linberg on final plans for the Boston convention. Mr O'Neil stated that there would be six or seven papers in the Intersectional Contest.

Mr Hayes presented the following report from the President's Advisory Committee, which was accepted without opposition:

"The President's Advisory Committee recommends to the Council that the President be empowered to appoint a committee of not less than three nor more than five members whose duty it shall be to consider employing an Assistant Secretary. The President, Treasurer, and Secretary, or their successors, shall be considered ex-officio members of this committee. It is suggested that at least one member of this committee be one of those who sponsored the letter from Paul Luck which has been sent to all members of the Council, and that one be from the present Advisory Committee.

This Committee is requested to report to the Council at its next meeting and to make definite suggestions as to type of man desired, approximate age limits, approximate salary, a general resume of his duties, and method of financing this new office.

In order to be more definite at this time, the President's Advisory Committee makes the following suggestions:

(1) Our Association has grown to the extent that more contact between the National Officers and Council and the individual sections and Committee Chairman is necessary to bring about continuity of operations and to preserve those worthy ideals which prompted our first organizers.

(2) We in particular need someone to assist the National Corporate Membership Chairman and the local sectional chairmen. It is expected that this Assistant Secretary would visit each section at least once yearly, consult with the Sectional Chairman and Corporate Membership Chairman, and furnish them with all necessary data and literature which they may require.

(3) He shall assist the local sections in arranging programs for their meetings.

(4) He shall assist the Publicity Chairmen especially along the lines of publicity from local sections.

(5) He shall contact schools and other associations at the discretion of the President and Secretary.

(6) He shall be available for convention work.

(7) He shall perform such duties as may be delegated to him by the secretary under whose direction he shall be.

(Concluded on Page P738)

Philadelphia Section——

OUTLOOK & TRENDS IN THE HOSIERY INDUSTRY*

WM G KNERR

Liberty Dye Works, Inc

The impact of new fibers in general on the hosiery industry is pointed out. The physical, chemical and dyeing properties of many new fibers are discussed mainly from the viewpoint of their interest for hosiery manufacture. The fibers mentioned include nylon, "Dacron" polyester fiber, "Orlon" acrylic fiber, dynel, "Merinova" casein fiber, "Vicara" zein fiber, and "Saran" vinylidene-chloride fiber. New dyeing and finishing equipment and methods receive comment.

INTRODUCTION

IT APPEARS that in a few years the consumer will find literally mountains of fibers to choose from. Dr Joseph B Quig at a meeting of the American Chemical Society predicted that 400 million pounds of synthetic items will be manufactured by 1953. He also mentioned that only 21 years ago the late Dr Wallace H Carothers gave a report to the Society on the first polyester fiber ever made. This was the Carothers-Hill fiber, nylon, regarded at that time as too expensive for commercial manufacture, but by 1939 it had become a reality. As you all know, it was a forerunner of the new wholly synthetic fibers on the market today.

Dr Winfield W Heckert, Assistant General Manager of the DuPont Co's Textile-Fibers Department, recently gave a paper at Buffalo, N Y, in which he stated: "The nylons have provided strong, elastic, and durable fibers with permanent setting characteristics. The acrylics have provided bulk and warmth, attractive aesthetic properties, ease-of-care properties, including the ability to form washable pleats and creases, and, in some cases, outstanding resistance to degradation by sunlight and various chemicals.

The polyethylene-terephthalate fibers, such as "Dacron" polyester fiber, have provided exceptional liveliness, resilience and crease resistance together with ease-of-care features similar to those of the acrylics. Today the primary problem is to find a polymer which can be formed into a fiber that can compete successfully with all of the fibers. This problem makes it necessary to determine the nature of the market for textile fibers.

Formidable economic hazards in the development of new fibers were cited also by Dr Heckert. Fiber-research and development costs are very high, because fibers cannot be manufactured in orthodox laboratory equipment. Extensive semi-works operations of a 3-shift 7-day-per-week schedule are required.

Thus, research and development cost can mount rapidly to something of the order of two million dollars per year and, over the interval required to arrive at the construction of a plant, can easily amount to ten million dollars or more. If the initial plant is a full-size economical unit, it can easily cost forty to fifty millions and require another twenty millions as working capital. The total stake in the project can at this point amount to seventy or eighty millions. This assumes no investment in intermediates manufacture. The latter can increase the stake by fifty or one hundred per cent.

NEW FIBERS FOR HOSIERY

NYLON———I hesitate somewhat to mention nylon as one of the new fibers, since it came out as long ago as 1939. However, it was still in the pilot stage when the war effort claimed it in 1941. During the war years nylon became the most sought-after fiber in the hosiery industry, when only rayon was obtainable. However, experimentation was continued. Previous experience had been with hosiery constructed of 40-denier yarn, of which the wearing qualities were very good. Experimentation led to the sheerer hosiery of finer yarns, such as those of 30, 20, and 15 deniers. When nylon returned to the hosiery market, women found that nylon was lovelier but did not wear so well. The reason was lighter deniers.

The dyers well remember the difficult position in which throwsters were beset as to whether or not nylon would be processed dry or processed wet after installation of machinery for the purpose.

During the few years that nylon has been made into hosiery, many things have been tried, such as twisting as much as forty turns to the inch and trying a crepe effect by knitting with one or two strands of silk, which is dissolved in a later process. In the dyeing of nylon, acetate dyes were used on the first nylon hosiery, and today they are still the best for ladies' hose.

Men's nylon socks, which require more wash resistance, are dyed with acid dyes. Several new methods in dyeing based on mechanical considerations have been introduced. One of the new methods is a continuous process on a preboarding type of machine with a series of spray jets for scouring and dyeing, followed by finishing and drying. The finished product is taken off the opposite end of the machine. Since the dyestuff liquor must be measured photometrically, it is necessary to have a clear solution. This is not possible with acetate dispersion-type dyes but only with acid dyes or direct dyes. Either one of these types present trouble with nylon-filament yarn, as one would expect from its dyeing index.

A measure of success has also been accomplished with a package dyeing machine in wrapping ladies' nylon hosiery on a spindle and using a cover or a cap.

The Gaston County Dyeing Machine Co has made a pressure dyeing machine, which is on the order of the conventional rotary type. It has a manhole for working space, and a 50-lb machine requires the

* Presented before the Philadelphia Section at the Abraham Lincoln Hotel in Reading, Pa, on April 25, 1952.

space of a 200-lb conventional rotary machine. The Smith-Drum Co is also building one of the pressure type similar to the conventional rotary machine. I have a blue print of this one that you are welcome to see after the meeting. It is a known fact that the new synthetics can be pressure-dyed in the yarn stage without the use of carriers and with much less dyeing time.

DACRON———"Dacron" is the most resilient of all synthetic fibers and consequently makes a very fine half hose. It does absorb acetate dyes only to a limited degree compared with nylon, and, to attain dark shades, assistants in the form of carriers must be used. It has practically no affinity for other classes of dyes at normal temperatures. Benzoic and salicylic acids in the form of 2-percent solutions have been used as carriers. At a liquor ratio of 1:25, a 2% solution means 50 lb of carrier per 100 lb of "Dacron", or $40.00 worth of benzoic acid at $0.80 a lb.

Some other carriers have been used, among which are Velanol TC, Decronyx and Dynadye. Some very good results have been obtained with these carriers. The use of carriers plus the extra work involved give costs that are high compared with dyeing nylon. This higher cost of dyeing is bound to be reflected in the cost of the finished product. It is found that "Dacron" half hose does hold up very well in appearance after use, whereas spun-nylon half hose, when washed several times, loses its good appearance because of pilling. Hose made of "Dacron" do not pill but do develop static electricity, which attracts dust particles. Perhaps it is fortunate that these fabrics are not faultless because the wearlife certainly would cut down production. It is a well-known fact that uniforms made with the new synthetics outwear three to four made of cotton and are reducing sales alarmingly.

A recent development in dyeing dark shades on "Dacron" staple has been announced by DuPont. Although acetate dyes have been used quite successfully, problems have been encountered in producing dark shades. Insufficient buildup, poor crocking fastness and the formation of tar in the dyebath have been serious objections. The newer method is a procedure for applying base and carrier, rinsing and applying naphthol in a fresh bath. Then diazotization and coupling follow in another fresh bath.

Black and navy shades with excellent fastness properties can be made by the above procedure. Deep maroon shades having excellent fastness can be made by this same procedure with Acetamine Oranges and an equal amount of Acetamine Developer A D Ex as the base.

ORLON ——— "Orlon" acrylic fiber, another DuPont product, is claimed to possess the handle of wool and to be far superior in many other respects. The chemical resistance of "Orlon" is one of its chief advantages over nylon. The most important objection to wide use of "Orlon", until recently, has been its resistance to dyeing. It has the least affinity for dyes of any of the new fibers. It is therefore excellent for white effects in cross dyeing. Acetate dyes again show the best affinity on this fiber in light shades. However, they are of no use in dark shades. The cuprous-ion method of dyeing first developed by Carbide & Carbon Corp was found to be an answer to the problem of applying dyes to this fiber. However, the reduction of cupric to cuprous copper salt necessary for the method caused the destruction of many dyes. Later, a modification of this method by substituting hydroxylammonium sulfate for formaldehyde sulfoxylate as reducing agent eliminated the disadvantages. One procedure is to use 2, 4 and 6 per cent of copper sulfate for light, medium and heavy shades, five per cent of paraphenylphenol and one, two and four per cent of hydroxylammonium sulfate. Still another procedure is to eliminate paraphenylphenol and to use 10 per cent copper sulfate. It is very important to know the type of "Orlon" to be processed. Each type requires a different method. I have samples of both types with procedures.

The 81 type, which has the least affinity, should be started with the maximum amount of hydroxylammonium sulfate. It is a waste of time ot start under 160° F or to slow up the dyeing process because of the very poor dye index of the fiber. The appearance of the 41 type seems to be the answer for good whites and for better dyeing results. It will be interesting to know what success we will have dyeing hosiery in the new high-temperature machine offered by Smith, Drum & Co.

DYNEL———Dynel is spun by Union Carbide and Carbon Chemicals Corp from a copolymer of acrylonitrile and vinyl chloride. Its outstanding features are rapidity of drying, long-wearing qualities, resilience, resistance to moths, dimensional stability and cashmere-like hand. Men's half hose are now being produced from dynel in a variety of washfast, bright colors. All of the leading manufacturers of half hose have been using this fiber, which has the advantage of not requiring preboarding.

A good white on dynel can be obtained by bleaching with sodium chlorite. As dynel is a thermoplastic fiber and behaves somewhat similar to cellulose acetate in the dyebath, sudden exposure to cold water may cause setting of wrinkles that will be difficult to remove. Also, temperatures above 180° F cause it to become delustered. Acetate colors are used almost exclusively with a minimum amount of wetting agent. Because this fiber must be dyed at a high temperature, it becomes delustered in dyeing but is relustered in the dyebath after the desired shade has been obtained by adding 60 to 80% sodium sulfate. Then the bath is cooled very slowly to 150° F to prevent wrinkles. Light shades are then simply rinsed, while darker shades are scoured at 170° with 2% of soap owf. For a higher degree of wash fastness, 2% of hydrosulfite is added. A finishing agent specific for dynel is applied, which gives it a desirable hand and minimizes its tendency to develop static electricity. Many acetate dyes in light shades on dynel display rather poor light fastness, especially when tested in the Fade-Ometer; in actual sunlight they rate higher by about one fastness class. The wash fastness of acetate dyes on dynel, however, is quite good.

Acid colors can be applied on dynel by the cuprous-ion method for dark colors, especially when p-phenylphenol is also employed as a carrier. The wet fastness of acid colors is exceptionally good. Some shades on dynel are advantageously obtained with a combination of acid and acetate dyes.

The finishing-boarding procedure for dynel is different from that for other fibers. The stockings must be tumbled dry before boarding. When boarding is done on internally heated forms, the steam pressure should not exceed 5 to 7 lb per square inch. When boarding is done on Proctor & Schwartz continuous machines, operating temperatures range from 200 to 210° F in accordance with sock weight, lighter socks requiring the lower temperature. To avoid distortion, it is necessary to cool the socks on the boards before stripping them by the automatic mechanism.

The United States Radium Corp is at present giving special attention to the Ionotron Static Eliminator to facilitate handling hosiery made from the new synthetic fibers. Static is at present one of the major difficulties.

MERINOVA———A new casein-protein fiber manufactured by Snia Viscosa of Milan, Italy, recently made its appearance in this country under the name of "Merinova". This new fiber is claimed to have the same characteristics as wool. "Merinova" is also said to be a distinct improvement over a former Italian casein fiber, "Lanital". Other claims for "Meri-

nova" are that it can be bleached to a good white and that it is only 10% lower in breaking strength than wool. The crimp is said to be good and it does not dust as did "Lanital". The dyeing procedure for "Merinova" is somewhat like that for wool in blends with the elimination of sulfuric acid. Fastness tests indicate that direct and chrome colors give the same fastness to washing and perspiration on "Merinova" as on wool but inferior light fastness.

VICARA ——— "Vicara", which is produced by the Virginia-Carolina Chemical Corp in Taftville, Conn, is the only protein fiber in commercial production in this country today. Unlike other synthetic protein fibers, the protein used in making "Vicara" is derived from corn.

"Vicara" is said to be much more resistant to chemical action than the previous manufactured protein fibers with which you are familiar. "Vicara" is capable of withstanding prolonged boiling, such as is encountered during dyeing. It may be carbonized without danger of deterioration and, unlike wool, it is capable of withstanding the action of dilute caustic alkalis. There is one physical aspect of "Vicara" that has caused the dyer some disturbance, that is, the natural water repellency of the fiber which makes it difficult to wet out and dye unless it is thoroughly intermixed with wool or some other fiber.

In a blend with wool it is called a cashmere. In a blend with nylon it adds the desired proporties of absorptiveness and softness. The dye shrinkage in acid dyeing is less than 5%. It is resistant to mildew, bacteria, moths, and carpet beetles. "Vicara" is being used quite extensively in the hosiery field.

SARAN———"Saran", a vinylidenechloride polymer was introduced commercially by the Dow Chemical Co in 1939. This thermoplastic material is used mostly for textile purposes in the form of monofilaments, which are woven upon modified looms to produce open-mesh materials, such as window screening, and closely woven fabrics, such as auto seat covers and upholstery fabrics. About 50% of the auto-seat-cover market is accounted for by "Saran". It is unmatched in its resistance to corrosive chemicals encountered in the atmosphere, it is not attacked by mildew, and it does not rust or corrode.

There has been a growing development in the use of "Saran" in the form of multifilaments and staple fibers. Multifilament fabrics are being used as draperies, tapes, webbing, and acid-resistant materials. Staple fibers are finding a market in flock carpets and other specialty products. "Saran" is supplied in powder form to intermeditae fabricators, who blend the simple basic colors available to get the colors necessary for end use. "Saran" piece goods can be dyed with acetate dyes with a loss in shrinkage of about 7% and a loss in tensile strength of about 5%.

In conclusion, since new methods of dyeing are still being developed for old fibers, such as linen, cotton and wool whose uses extend back into antiquity, it is to be expected that for the new fibers many of the present techniques and even the fibers themselves will be subject to considerable alteration or may be discarded entirely for new fibers or new discoveries.

Council Meeting——

(Concluded from Page P735)

We suggest a man who has had some office and business experience and with some knowledge of chemistry and textiles.

He will not in any way supplant our volunteer workers who are the heart and soul of our organization but by contact with them and furnishing them information and making suggestions will enable them to achieve more and it is felt will encourage more volunteer work.

We feel our Association needs a new man as outlined above and so recommend."

Mr Jacoby stated that the Membership Committee proposed to sponsor for Senior membership the applications of citizens of foreign countries unable to find Senior member sponsors in their own countries, but able to furnish satisfactory evidence of professional standing.

On recommendation of the Committee each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objection be received meanwhile by the Secretary.

SENIOR

Agrella, C J
Athorn, L N
Bradshaw, A R
Brandt, H H
Bridges, H C
Brown, B H
Castka, A
Cobb, C J
Coldren, V
Cole, R H
Conn, R C
Crawford, R F, Jr
Diserens, L G
Drake, N
Fisher, C H
Flatow, G G
Fortunato, D M
Fulton, W G
Garzanti, A
Green, M E
Hakin, R J
Hampshire, W H
Harrison, W F, Jr
Hoffman, S
Johansson, H T
Johnson, H W
Leach, A J
Leatherland, L C
Makant, K L
Moreau, A J
Mueller, M W
Natter, S
Oechslin, L A
Parkinson, H F
Peters, E H
Pike, T H
Reed, H L
Reynolds, J A
Seibel, B
Setterstrom, C A
Sponagel, R K
Susich, G
Thompson, L C
Ward, G R
Whitley, W B
Wise, H F
Wood, S
Zukowski, C J

JUNIOR

Adams, O A
DePetro, T J
Hamilton, L R
Helms, H J, Jr
Holthouser, R M
Lister, E J
Robey, S L
Scholten, J
Seitz, W
Sturtevant, H B, Jr
Trexler, H L, Jr

ASSOCIATE

Alden, G R
Balzarotti, P
Brasca, D
Connolly, F V
Haim, R
Hawkinson, A T
Horsman, E S
Nadkarni, P S
Pennie, R N
Stephens, R D
Teixeira, N A
Weber, J
Wells, R W
Whitt, C D

STUDENT

Choquet, R H

Each of the following was transferred from other classifications to Senior membership:

Achey, D M
Barnes, W S
Barrett, C M
Baum, B
Burrows, R H
Jakob, E C
Kennedy, J H
Knott, W A
Koshak, D T
Lincoln, W E, Jr
Milana, R E
Neff, W H, Jr
Serano, C
Sheehan, L C, Jr
Sherriff, R F
Siegel, M
Vollers, L P, Jr
Wolhar, C J

Thanks were voted to the Philadelphia Section for its hospitality on this occasion.

Respectfully submitted,
H C CHAPIN, *Secretary*

—♦ ♦—

UTI Student Chapter Meeting

AT A MEETING of the Utica Technical Institute Student Chapter on October 14, 1952, a Program Committee was appointed, with Robert T Holland as Chairman and Betsy Beil, Vice Chairman. It was voted that an AATCC button be purchased for each member. Tentative plans were made for two technical meetings, with Freshman to be invited as guests.

Respectfully submitted,
BETSY BEIL, *Secretary*

Philadelphia Section——

THE DYEING AND FINISHING OF HOSIERY*

HAROLD L DE TURCK
Supt of Dyeing and Finishing
Berkshire Knitting Mills, Reading, Pa

INTRODUCTION

I WOULD like to mention again, that we at Berkshire Knitting Mills are happy to welcome the members and guests of the Association.

The chances of returning to the pre-war and war days, when we were processing ladies' hosiery manufactured from silk, viscose, acetate, cuprammonium and cotton yarns are pretty remote. We are in the age of synthetics. The great majority of the people visiting this section probably have to do with nylon, "Orlon", "Dacron", dynel, "Aralac", etc, while my problems are concerned mainly with nylon.

The main purpose of my paper will be to discuss problems that confront us in processing ladies' hosiery, as we know that synthetic fibers present numerous technical difficulties the moment the yarn leaves the manufacturing plant. A few experiences that we have had with some of the newer synthetic fibers will be related as well as those with the older nylon.

FUNDAMENTAL AND HISTORICAL

THROWING——The throwster receives nylon from DuPont on pirns. The first throwing operation consists in redrawing yarn from pirns onto twisting spools. The next step is twisting. This is usually done at a range of speed of 7,500 to about 12,000 RPM, or even higher on newest equipment, largely depending on what twist is required. After that the yarn is sized on regular sizing machines, such as type 250 manufactured by Universal Winding Co, Providence, R I. Again depending on twist and denier, the size content may be as low as 2% but usually averages nearer 4%. Low-twist yarns, such as welt yarns, normally carry a low percentage of size, and high-twist yarns, such as 30-denier, 30-turn and 20-denier, 40-turn, a high percentage. Practically all hosiery yarn is sized with a solution containing polyvinyl alcohol. There are other compounds being offered from time to time, but so far the throwsters have not found anything to compare favorably with polyvinyl alcohol, principally for the reason that PVA produces a yarn firm enough to permit knitting a broad and clear fabric. After twisting, the yarn is coned over oil. The percentage of oil on the yarn is of great importance and is carefully regulated by the degree of contact on the rolls over which the yarn is traveling. Coning is a delicate operation if one wants to make sure that the density of cones does not vary unduly. This can be regulated largely by both tension and pressure. The setting of twist is done either after twisting or after sizing. That again depends on individual requirements. In any case it can well be accomplished by either varying the temperature of dry and wet bulb in twist setting boxes or the length of time required to do it. The average dry-bulb temperature is between 170 and 180° F, again depending on the twist, the wet-ulb usually being about 10 degrees lower.

H L De Turck

From one of the largest stocking mills we get an historical and fundamental discussion of the manufacture of women's hosiery from throwing, sizing, and knitting to scouring, dyeing, and finishing. The chemicals and dyes for these various processes receive consideration.

As present manufacture is concerned mostly with nylon, that fiber is given most attention. The author discusses briefly, however, the dyeing and physical properties of another polyamide fiber that may become important for hosiery, namely, "Perlon", and he also reports on some dyeing experiments with "Dacron" polyester fiber. Stockings made from both these fibers were shown at the meeting.

As for oxidation, there is none of sizing compounds, and, in the case of oils, those that are largely compounded of organic oil will have to be watched. Rancidity may seriously hamper the knitting quality of yarn and eventually might even weaken it, not to speak of the fact that it may have serious results on knitting-machine parts. Sizing solutions are regularly checked for viscosity by automatic control so that take-up of size will be uniform.

Where yarn is required fully preshrunk, preshrinking is accomplished by immersion of yarn in boiling water for about 30 minutes. In that case it is important to immerse the yarn in a relaxed form, so as to obtain greatest possible uniformity of shrinkage. Yarn thus shrunk should have an average residual shrinkage of not more than ½ to 1%.

In all operations, control of relative humidity as well as temperature is very important. For example, in the sizing departments the temperature is always 80° F and the relative humidity is 50%. If by reason of mechanical failure the relative humidity should vary more than 1-1½% up or down, the sizing operation should be stopped in order not to run the risk of uneven take-up. In other departments the relative humidity may be a trifle higher; coning, for example, is done at 60 to 65% RH.

As for "Dacron" polyester fiber, Pm-90 has been used successfully for hosiery as well as for tricot. "Orlon" acrylic fiber has been sized for hosiery with poly-acrylic-acid solution.

KNITTING——The verb "knit" is derived from the Anglo-Saxon word "cnyttan" and carries the original meaning of "threads woven together by hand". Thus we have "knitting", the art of mak-

* Presented before the Philadelphia Section on the afternoon of April 25, 1952, in the Berkshire Recreation Hall of the Berkshire Knitting Mills, Reading, Pa.

ing a loose, elastic fabric by the interlocking of one or more continuous yarns or threads by the use of needles of various character, either by hand or machine, forming rows of connected loops. Or, to simplify the meaning to cover our particular field, we may define "knitting" as the art of forming a single thread into a loop web or fabric.

Like many other important inventions, the credit for the invention of the knitting machine goes to one unskilled in the mechanical arts and possessing none of the knowledge that is considered necessary for the devising and producing of machinery. In 1589, the Rev William Lee, of Knottinghamshire, England, a young minister who held an MA degree from St John's College, Cambridge, gave to the world the first machine on which knitted fabrics could be made. By the year 1640, stocking manufacture had become an established industry in England.

In 1864, William Cotton of Loughborough, England, brought forth certain inventions that were destined to revolutionize the trade on the flat-frame full-fashioning power machine, which has since been the standard for all types of full-fashioned knitting machines. This machine was essentially the same as those being manufactured today.

The machine as developed by Cotton was exported to Germany in limited quantities in the year 1876. Shortly thereafter several German machine builders in or around Chemnitz took up the manufacture of full-fashioned machines of this type. After the introduction of this machine in Chemnitz, Germany rapidly developed a home and export market for hosiery, and approximately 70 years ago the first German machine was exported to the United States.

In the year 1898, the first full-fashioned knitting machines of American manufacture were placed on the market by the Textile Machine Works of Reading, Pa. The first machine, however, was not sold until 1902, and only 8 machines were sold up to 1907. Since that time, constant improvements have been made in the manufacture and operation of the machine as well as in the product itself, which have resulted in our present-day machines and extensive industry. The term "full-fashioned hosiery" means simply "stockings that are shaped in the knitting process to fit the leg and foot of the wearer".

The full-fashioned knitting machine of today is manufactured in single-section units as well as in those containing 4 to 32 sections, on which a corresponding number of individual stocking blanks are knit simultaneously. Each section of these machines is practically a knitting machine in itself; but all work together, being driven by a common drive and affected simultaneously by several mechanisms that function on the machine as a whole.

After this brief history of the development of the knitting machine, I will try and give you some of the basic principles to be observed in the knitting of a good full-fashioned stocking.

First of all, we must consider the right type of yarn for knitting. The yarn must be strong, soft, elastic, uniform and pliable, especially with respect to bending strains. Softness is necessary since the fabric is in actual contact with the human body and should not irritate the skin or otherwise be uncomfortable. It should be elastic so that the loops will withstand the strain of the knitting process. It should be pliable so that the yarn may assume and keep its looped shape for the short period that elapses between the start and completion of the loop formation. The various types of yarn used in the manufacture of stockings have been silk, rayon, mercerized cotton and nylon. Nylon, the first of the latest series of artificial fibers, is a vast improvement over other fibers with regard to tensile strength, elasticity, uniformity, and durability.

The second step in the manufacture of good stockings is the proper tensioning of the threads during the knitting operation. Correct tension assists in giving clear, even loop formation, which is very essential for a quality product. As the size of the yarn changes, it is desirable to change the length of the loop, heavier yarns requiring longer loops and finer yarns, shorter loops.

Another important feature in knitting is the maintenance of uniform temperature and humidity in the knitting room. A uniform temperature and humidity is necessary in order to insure the smooth performance of the machinery as well as the smooth handling of the yarn going into the stockings.

SCOURING———Every part of the textile industry is continually confronted with problems of scouring. How this is accomplished depends primarily on 1) condition of material, 2) type of material to be processed, and 3) chemicals.

In the textile field, chemicals for scouring can be grouped as follows: a) soaps; b) synthetic detergents; c) builders.

Soap is our most common detergent and one of the cheapest. By "detergent" is meant an agent with ability to remove and suspend soil. Soap is the sodium or potassium salt of stearic and other fatty acids. The most widely used fatty acid is oleic acid, and it is with soap with this base that I am mostly interested in. Oleic acid is an unsaturated fatty acid with eighteen carbon atoms, and, like most unsaturated fatty acids, possesses a very low freezing point, being liquid down to a temperature as low as 3° C. It may be generally stated that soap made of unsaturated fatty acids possesses greater solubility (both in water and hydrocarbon solvents) than soaps of the corresponding saturated acids. Sodium-oleate soaps are excellent cleaning agents, harmless, nonirritating to the skin, and quick-lathering. They give large amounts of stable suds, which rinse out speedily. In our business quick rinsing is important for saving time.

Synthetic detergents have grown in this last quarter century from a laboratory scale to a production of well over a billion pounds a year. Each day finds new uses for these products and we might say the end is still not in sight.

One of the main advantages of synthetic detergents over soaps is the fact that their lime, magnesium and iron salts are fairly water soluble and therefore do not precipitate from hard water. In addition, they can be used in an acid medium with retention of detergent and foaming properties.

An interesting use of a nonionic detergent in an acid medium can be found in cleansing black-heel stockings where dye has migrated because of preboarding and must be removed from the white portion of the stockings. This can be accomplished by using the following formula:

5% alkylsulfonate
5% nonionic detergent
190° F for 15 minutes.

To same bath add
4% zinc sulfoxylateformaldehyde
1½% formic acid, 85%
190° F for 30 minutes.

Rinse.

At 100° F, add 2% sulfated fatty alcohol and 1% ammonia and run 10 minutes.

Nonionic detergents also find use in removing antistatic agents, which are cationic in nature. We have encountered two difficulties in the use of nonionic detergents: first, above a certain percentage they do not seem to rinse out readily and make it necessary either to increase the rinsing time or to use more rinsing baths, and secondly, as you increase the temperature of a bath above 140° F the wetting time appears to decrease and at high temperature, that is 200° F, after a certain length of time, the product is changed either physically or chemically. While there is no evidence of spotted goods, distinct cloudiness of the product raises fears that there may be. The common builders that are used with either soap or synthetic detergents are as follows:

1) caustic soda
2) ammonia water, 26° Bé
3) various phosphates
4) carbonates
5) silicates

In concluding this part of the talk regarding scouring, I should mention the difficulty of removing sizing oils and machine oils that have oxidized. There is no doubt in my mind that oils that contain fatty acids in their composition are vulnerable to oxidation. This problem of oxidation is not too serious if hosiery is processed promptly after knitting; however, storage of hosiery for periods of one month to 6 months or longer is cause for trouble. Recently I saw hosiery that had been preboarded 1 month earlier. Every week a change in shade could be noticed in that the goods became yellower. When this type of goods is dyed with clean hosiery, two distinct shades will be obtained from one dyebath. The use of Textone to clear the yellow cast has not been successful.

The detergent combination that has given us the best scouring in both monetary value and cleansing efficiency was made up of soap and caustic soda. Our second choice was a combination of soap, nonionic detergent and soda ash. The addition of solvents to the regular scouring procedure did not improve the results enough to warrant the increase in cost.

DYEING

NYLON———We agree that the dispersed acetate dyestuffs are the most easily handled of all types of dyestuff for dyeing nylon full-fashioned hosiery. The method a dyer uses in arriving at the end product depends on the manipulation of procedures, products and machinery. Certain groups favor each of the following procedures:

1) Starting at a low temperature and raising the bath to the desired temperature within x minutes.
2) Raising the temperature in steps, that is, running the dyeing for several minutes at one temperature before heating the bath to the next temperature, etc.
3) Starting at a desired temperature and continuing the dyeing at that temperature.
4) Use of the one-bath method.

It is felt by some of us that dyestuff manufacturers have not done too much research on the acetate dispersed dyestuffs. For example, the Scarlet B type from any manufacturer is the weak sister of a three-color combination. It is the last of the 3 colors to be exhausted. It is the most difficult of the three colors to disperse and probably could be ground finer.

There is a scarlet, which I will call Scarlet GC (no CI number), that draws nearly at the same rate as the blue and yellow. For 15-denier work it is satisfactory as long as you catch the shade within a short time, say one hour. After that it migrates very rapidly to the main part of the stocking.

We made experiments with a straight, direct, acetate brown, which dyes nylon a slightly dull reddish shade. We matched the brown with three regular dispersed colors in order to determine whether the brown and the combination both reacted the same under natural and artificial light. The color could be matched, and we proceeded to use this brown as a base for medium and dark colors. The washing tests were excellent; however, the light fastness was not as good as obtained with the blue, yellow and scarlet combination. We believe that a good straight brown with better light fastness would make for better dyeing.

Although dispersed dyestuffs are firmly established for dyeing nylon, we have not overlooked the possibility of using water-soluble cellulose-acetate dyestuffs. Imperial Chemical Industries, Limited, have marketed a limited range of water-soluble dyestuffs under the name of Solacet dyestuffs, from which the solubility-imparting group is split off during application. The Solacet colors are salt-exhausting on acetate and acid-exhausting on nylon, that is they dye like a direct color on acetate and an acid color on nylon. We used the following combination:

Solacet Orange 2 GKS
Solacet Scarlet BS
Solacet Blue 2 BNS

With this group of dyestuffs it is necessary to dye at 200° F with the addition of acetic acid for exhaustion of the bath. The scarlet is the most difficult to exhaust.

We are continually looking for dyes having better light and wash fastness. The group that probably answers this purpose would be the acid dyestuffs. Most of us I am sure know the problems connected with dyeing nylon with acid colors. Acid colors have a tendency 1) to emphasize irregularities in nylon yarn, 2) to be incompatible with other dyes, 3) to show variation of shade with temperature.

We picked what we thought were the best of the level-dyeing acid colors:

Milling Yellow 5G, Colour Index 642,
Neutral Brown BGL, No Colour Index No, and
Neutral Gray L, No Colour Index No.

We used a 30-denier style and knit some single carrier and some three carrier.

The goods were dyed in a rotary machine and later had a pairing report record to check any difference that might show up. The stockings knit single carrier did not have a passable stocking. The three-carrier knitted stockings had approximately 60% passable.

There is no doubt in my mind that, had the above stockings been dyed with dispersed acetate dyes, we would have had at least 90% passable stockings. From these tests it may be concluded that the acid dyestuffs are rather difficult to manipulate in a rotary machine. It is possible that high-temperature and high-pressure dyeing might overcome or correct some of these faults.

DACRON———Stockings made of 15-denier monofil "Dacron" polyester yarn were also experimented with. The stockings were preboarded in the conventional way and then were scoured with soap and caustic soda. The "Dacron" was dyed in the presence of

10.0 g/liter benzoic acid
1.0 g/liter Merpol C.

The dyebath was set at 160° F, the benzoic acid and Merpol C were added to the bath. The dye was added and raised to the boil and run 1 hour at the boil. The pH of this bath was 2.0. The following dyestuffs were used:

Acetamine Yellow N, No CI No,
Celanthrene Red 3 BN Conc, Pr 61
Artisil Direct Blue GFL, No CI No.

The dyeing was rinsed and scoured with 6% soap and 2% caustic soda, both owf.

I have one stocking dyed in the presence of benzoic-acid carrier and another in the presence of sulfated fatty alcohol with the same dyes, and you will observe the part the carrier played in the dyeing.

PERLON———A few words concerning "Perlon" which is the German equivalent of nylon. We know that three types of "Perlon" were made in Germany during the years 1939-1945. They were called "Perlon" T, "Perlon" L and "Perlon" U. It is doubtful whether the present "Perlon" that is on the market represents any of the above three, because the sample that was in our possession equalled and in some respects proved superior to nylon. The three types mentioned have much lower melting points, that is, the melting point varies from 175 to 220° C, which is approximately 80° C lower than nylon. This is a drawback because it cannot be used in material that must be ironed.

It might be interesting to mention some of the physical properties of the present "Perlon" as compared with nylon.

"Perlon" U, according to R W Mon-

crieff's book on "Artificial Fibres", unlike nylon, will not dye at all with acid dyestuffs, and can in fact be satisfactorily dyed only with insoluble colors of the dispersed-acetate type.

The sample of "Perlon" that we had for experimental purposes dyed very easily with dispersed acetate colors. When "Perlon" and nylon were dyed together, the "Perlon" dyed much heavier and with a reddish cast. Those of you who remember the dyeing index of type-250 nylon will recall that it dyed heavier than our present type-200 nylon. You can therefore arrange the dyeing indexes of these fibers going from a light to a heavy shade as follows: type-200 nylon, type-250 nylon and finally "Perlon".

It is apparent that this type of "Perlon" differs from the "Perlon" U type as to the dye receptivity of acid dyestuffs. Individual dyeings were made on swatches composed of "Perlon" and silk. Practically all the acid dyes dyed the "Perlon" heavier than the silk. The dyestuffs found to give the best union between "Perlon" and silk were

Acetamine Yellow N, No CI No,
Acetamine Scarlet B Ex, Pr 244,
Celanthrene Brill Blue FFS Ex Conc, Pr 228.
Milling Yellow 6 G, No CI No,
Calcocid Milling Red G, CI 443,
Xylene Brilliant Cyanine G, Pr 223.

Dyeings were made at 180° F in the presence of 6% sulfated fatty alcohol and sodium sulfate.

PHYSICAL TESTS

Perlon (30/9/30S)		*Nylon (30/10/30Z)*	
Tenacity	*Elongation*	*Tenacity*	*Elongation*
g	%	g	%
20	2.15	20	1.80
40	8.00	40	6.55
80	12.65	80	11.65
120	16.10	120	15.30

MULLEN TEST

Grey		*Finished*	
Perlon	72.8 lb	Perlon	80.1 lb
Nylon	67.3 lb	Nylon	74.7 lb
	(8.19%)		(7.36%)

SCOTT TEST

Grey		*Finished*	
Perlon	42.70 lb	44.00 lb	
Nylon	39.45 lb	39.83 lb	
	(8.24%)	(10.42%)	

WASH TEST———A pair of "Perlon" stockings was given a regular wash test to determine whether or not they would retain their shape, and the result showed that there was no change and they held their regular finished form. In drying, the "Perlon" stockings took approximately five minutes longer than the nylon.

WEAR TESTS———Even though the mechanical tests proved superior, the average wearing tests were not so good when compared with those for 30-denier nylon. The wearers' opinions were that the "Perlon" felt softer and more like silk than the regular nylon.

NYLON-SILK———Not too long ago an idea was expounded which had to do with developing a crepe nylon stocking by manufacturing a stocking having nylon and silk twisted together. The silk-nylon stockings were preboarded in the usual way. The gum was then removed with soap and soda ash, and the stockings were subjected to a 6% solution of caustic soda at 155° F. The temperature was raised to 190° F in 15 minutes, held at 190° F for 15 minutes, and then was allowed to cool back to 160° F in approximately 15 mins. After the dissolving of the silk, the nylon stockings were dyed in the conventional manner.

This experiment was tried on 15-, 20- and 30-denier nylon. 20-denier nylon stockings with silk gave the best crepe effect. As to the value of the end result and the practicability of the process, we leave you to be the judge.

STRIPPING

At times I "kid" my youngsters about the number of times they erase when doing their home work. The rubber eraser has been a life saver for oldsters as well as for youngsters. We in the textile business find ourselves blessed with erasers, that is, in reducing agents in the form of hydrosulfite, zinc sulfoxylate formaldehyde, and sodium sulfoxylate formaldehyde. For use on full-fashioned nylon hosiery we are inclined to favor the sulfoxylate formaldehyde type. It is without a doubt an expense we would like to do without, but problems present themselves and we welcome the erasers.

CONVENTIONAL STRIPPING———In conventional stripping the normal procedure is to use 3-5% zinc sulfoxylate formaldehyde, together with 3-5% of 56% acetic acid (on wt of fiber, owf) at a temperature of 180° F for a period of 30-40 min depending on the depth of the shade. This should be followed with a rinse at 180° F and two rinses between 100-120° F. Lastly, we conclude with a soaping with ammonia water and a fatty-alcohol sulfate.

We have found that you can speed up stripping time by replacing the acetic acid with half the amount of formic acid, 85%. Caution must be used in handling formic acid to avoid the pungent fumes and also to avoid fusing the nylon from direct contact with strong formic acid. It is advisable to dilute the acid thoroughly before adding it to either rotary or paddle machine.

Lately laboratory experiments have shown that a combination of 2 parts of zinc sulfoxylate formaldehyde and one part sodium sulfoxylate formaldehyde together with formic acid gives excellent results. We have stripped stockings in 20 minutes which normally took 40 minutes.

ALCOHOLIC STRIPPING——— The procedure that I am about to discuss was carried out in the laboratory and is called stripping by alcoholic Soxhlet extraction. It is rather novel, but in this day and age the wildest dreams sometimes become realities.

The welts of dark colors were weighed and extracted with

1) CF absolute methyl alcohol
2) Synasol, an ethyl alcohol
3) another proprietary ethyl alcohol

The extractions were run for 9-12 cycles. The loss in weight due to finish and dyestuff varied from 0.70 to 1.00%. The welts stripped with the methyl alcohol had a bluish-white color, while the ethyl alcohol extractions produced a grayish-white color. The solvent alcohol containing the stripped dyestuffs was evaporated off, the dyestuffs were dissolved in water and the welts were redyed with the stripped dyestuffs.

We tested individual dyeings of acetate dispersed blues, yellows and scarlets from various dyestuff manufacturers and found all satisfactory for solvent extraction. These same pieces were then redyed with the extracted dyestuffs, each in a separate bath.

We continued the experiment further by trying a few acid colors. The following solvents were tried but with little success:

(a) carbon tetrachloride
(b) ethylene dichloride
(c) chloroform
(d) trichlorethylene
(e) ethyl ether
(f) formaldehyde
(g) methyl n-aryl ketone
(h) carbon bisulfide.

FINISHING

There has been some progress made in drying hosiery over the old days when stockings were placed on wooden forms, placed in a drying box, such as the Sturtevant dryer, and allowed to dry with hot air. This box had three separate compartments, each holding 24 forms, thus enabling the operator to work in a cycle.

Today we are working with three systems, namely, (1) the conventional drying system, (2) the conveyor and tray drying system, (3) the Dunn system. It might be well to describe each briefly.

CONVENTIONAL SYSTEM ——— One or two operators work this type of machine. This system depends on heat from coils to be circulated through the

machine by means of a fan. Stockings are placed on forms by operators, and after these pass through the drying chamber the stockings are automatically removed from the boards and stacked in piles of 12. Drying temperatures range from 180-200° F.

CONVEYOR AND TRAY DRYER ———In the conveyor, drying stacks of 12 stockings are placed cross-ways on an endless belt as close together as possible without overlapping. This aids in forcing the down draft of hot air through the stockings. The temperature of the conveyor dryer can be varied from 200-240° F. To obtain maximum production and possibly maximum stiffness the belt speed should be regulated to approximately 4 feet per minute.

In the tray dryer the same effect is obtained with circulated hot air in which the stockings are placed on trays, of which there are two to each unit. They operate satisfactorily at a temperature between 190-200° F.

DUNN SYSTEM———Most of us are acquainted with the Dunn system. Briefly, the stockings are preset in a steam medium either after knitting or after seaming, dyed and then the final drying is done on a preboarding unit in order to set the stitch and shape the stockings. It might be said that, in order to have the conventional conveyor and tray system function properly, the hosiery must be set or preboarded correctly. In addition, the goods must be bagged properly before dyeing.

FINISHES ——— After dyeing, nylon hosiery is given a finishing treatment, which results in a better appearance and better handling qualities and which serves to prevent snagging or other injury to the goods. These finishes generally consist of dispersions or emulsions of resins, which form a protective film evenly deposited over the goods. The finish also serves to aid in locking the knit so as to retain a neater shape and appearance.

There are three principal types of resin finishes in use, differing in kind of resin. All of them consist of thermoplastic synthetic resins, modified by means of plasticizers to fill the particular requirements and emulsified to facilitate application. They are applied in a lukewarm water bath, generally in amounts of under 10% owf. The resin is set by the drying operation following application of the finish.

One type of finish is a polyvinyl acetate resin emulsion. This finish serves best to impart firmness and good handling quality to the fabric, and at the same time gives good snag resistance. In some instances, the addition of common salt aids in exhausting the resin.

A second type of finish in use is an acrylic-resin emulsion. This type often requires the use of acid to aid in exhausting the bath. The acrylic finishes give only a soft to fair hand, but have good snag-resistant qualities.

The third type of finish is a polystyrene-resin emulsion. These finishes generally exhaust well without other agents and thus may often be used in smaller amounts. They do not produce as firm a hand as the polyvinyl-acetate type, but generally firmer than the acrylic-type finishes. The snag resistance of a polystyrene resin is good, and it imparts a quite dull but good appearance to hosiery.

Frequently a combination of different resin finishes may give a more desirable result, since anyone alone may not produce the qualities wanted. Often it is necessary to use other agents, such as starches, ingrains, waxes, or softeners to modify the products. The method of drying largely dictates these needs. It is usually possible to find a combination of these agents to produce just the fabric that is needed.

A finish formula also depends upon the style of stocking, since different gauges and deniers require varying types of finishes. The problem of the goods sticking together in the case of conveyor drying, and sticking on the boards in conventional drying must also be considered.

The most recent type of finish in the nylon hosiery field is rather unique in that it is made of a resin very closely related to nylon itself. It is a dispersion of type-8 nylon, which is a copolymer of the nylon resin family. This resin is different from the three general types in that it cannot be easily emulsified. Different manufacturers use different methods of formulation, but, generally speaking, ethyl alcohol must be used as an intermediate solvent before emulsification is possible. The result, when the resin is applied to hosiery, is also different from that obtained with older-type resins. There is no great claim for fullness of hand, even though greater amounts are applied. The snag resistance of this resin is average, as is also its dullness. Type-8-nylon finish also is known to give a smoother hand, resembling the hand of silk. Another claim for this finish is water absorbency. Actual wearing tests made by us have not proved this claim.

The writer wishes to acknowledge the assistance of Paul Hemmerich for supplying the information pertaining to throwing. I also wish to thank Owen Degler and David Johnson from our laboratories for helping to prepare the experimental data.

Western New England Section Meeting Report

October 3, 1952
Rapp's Restaurant, Shelton, Conn

THE first meeting of the 1952-53 season for the Western New England Section was held on October 3, 1952 at Rapp's Restaurant, Shelton, Connecticut. Seventy-two members and guests were present to participate in an open forum discussion on "Dyeing Synthetic Fibers". Among the guests were J Robert Bonnar and Raymond W Jacoby, the two AATCC presidential candidates.

Serving on the panel were Paul J Choquette of General Dyestuff Corporation; William A Holst, National Aniline Division of Allied Chemical & Dye Corporation; Dr Paul L Meunier, E I du Pont de Nemours and Company; Dr A L Peiker, Calco Chemical Division of American Cyanamid Company, and Mr Jacoby representing the Ciba Company.

The following officers were elected to serve during 1953:

Chairman: R C Geering, Princeton Knitting Mills
Vice Chairman: A S Nyquist, American Cyanamid Company
Treasurer: S V Vaniotis, Ciba Company
Secretary: N J Glade, American Cyanamid Company
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W J Barnes, Bridgeport Fabrics
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A W Goodwin, Princeton Knitting Mills
S G Hoffman, Hat Corporation of America
MacLean Lasher, H MacLachlan Company
Councilor: J E Lynn, American Cyanamid Company

Respectfully submitted,
A S NYQUIST, *Secretary*

—♦ ♦—

PTI Student Chapter Officers

THE following officers were elected to serve the Philadelphia Textile Institute Student Chapter for the 1951-52 school year:

Chairman——Albert McLuckie
Vice-Chairman——John S Thackrah
Secretary——Earl G Holden

Secretary's Report—— Piedmont Section Meeting

Sept 13, 1952
Hotel Charlotte, Charlotte, N C

THE annual Fall meeting of the Piedmont Section was held at the Hotel Charlotte, Charlotte, N C, on September 13, 1952.

A meeting of the Section's Research Committee at 10 a m, presided over by Dr H Y Jennings, preceded the afternoon technical session, which was presided over by Neil Truslow, U S Rubber Co.

Speakers at the technical session included F L Dennett, Dow Corning Corp, on the subject "Silicones in Textile Processing", and Roland E Derby, Derby Co, Inc, on "Spectrophotometry and Color Matching".

H A Barnes, who was observing his 25th anniversary as chairman of the Piedmont Section, was honored at the evening banquet in the Ballroom. Guest speaker at the event was R Arthur Spaugh, president of Washington Mills, Winston-Salem, N C, president of the University of North Carolina Alumni Association and past president of the North Carolina Cotton Manufacturers Association.

Russell Lawrence, Rohm & Haas Co, was in charge of meeting arrangements.

Respectfully submitted,
M M McCANN, *Secretary*

Membership Applications

SENIOR

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Fred B Shippee

A PRACTICAL APPROACH TO TEXTILE POLLUTION ABATEMENT AND WASTE TREATMENT

DUANE W SNYDER

Plant Chemist, Crompton-Shenandoah Co
Waynesboro, Virginia

INTRODUCTION

WITH the advent of legislation by local, state, and federal governments for the control of polluting wastes discharged to surface waters, it has become necessary for the textile industry to assume its share of responsibility in pollution abatement. This paper is intended as a guide for dyeing and finishing plants in carrying on a reasonable and practical program of pollution abatement and waste disposal.

The most practical approach would be to assign the program to the chief chemist with the assistance of one or more technically trained men. The enlistment of cooperation from production and engineering management would be most helpful to the personnel responsible for the pollution abatement and waste treatment work.

The approach to the problem falls into two phases of development: 1) a study of all types of wastes stemming from the various processes, with the object of reducing so far as possible the polluting materials therein, and 2) the selection of the most economical and effective waste treatment method with the aid of pilot plant studies.

DISCUSSION

WASTE STUDIES——Waste from each wet process should be sampled and analyzed to determine biochemical oxygen demand, pH, alkalinity, sedible solids, total solids, color, temperature, and volume. After a thorough knowledge of the individual wastes is attained and composite waste characteristics are collected, possibilities of reducing the polluting substances therein may be examined along with methods for waste disposal.

POLLUTION ABATEMENT——In the production of textiles, oftentimes a large "margin of safety" is incorporated into the processing. This margin can be reduced while still maintaining quality production and reducing pollution since the "margin of safety" is predominantly chemical in nature. With adequate automatic chemical feed controls, this excessive chemical consumption and waste may be largely eliminated in wet processing.

Another source of pollution is found in the poor selection of processing compounds. It is generally well known that soaps show extremely high Biochemical Oxygen Demand (BOD), whereas some synthetic detergents show little or none *(1)*. Detergents should be selected not only because of their efficiency merits but also on the basis of their BOD values.

Warp sizing materials removed from fabrics prior to dyeing constitute a major portion of the polluting wastes which come from the dyeing and finishing plant. Natural sizing materials exhibit high BOD values, leading to an examination of the possibilities of substituting or modifying the warp size with synthetic materials. Some synthetic sizing materials show as much as 99% less BOD when compared with natural sizes *(2)*.

The Marhen process for controlled vat dyeing *(3)* shows some evidence of reduced pollution load from the dyeing operation. This process, when applied in the control of sulfur dyeing, may result in reduction of sulfide concentrations in the waste.

The above examples illustrate only a few of the possibilities for reducing the pollution at the source. For a thorough and complete abatement program the cost is high; however, the cost of treating textile waste is also high. On the other hand, the abatement program may net savings which will compensate for the expense incurred in making the necessary studies in connection with this work.

The pollution abatement program may, in some cases, reduce the pollution to the extent that treatment facilities can be reduced in size or eliminated entirely. This depends, of course, on the volume and character of the waste as well as the size and condition of the receiving stream.

WASTE TREATMENT

This phase of the problem should not be approached until everything possible has been done to abate pollution at its source, and then only with caution. A great deal of work has been done along the lines of textile waste treatment in the past, but since no two finishing plants produce the same quality or quantity of waste, it becomes necessary for the plant to investigate each treatment process that may be used for its waste. The most practical and economical method of selecting the proper treatment system demands initial pilot plant studies. Operation of a waste treatment pilot plant over a long period is essential to the successful design of a full-scale, efficient treatment plant.

The waste treatment pilot plant should be constructed for the utmost versatility and should allow for studies of the following treatment processes or combinations thereof:

1) Neutralization
2) Equalization
3) Chemical Flocculation
4) Aeration
5) Biochemical Oxidation
6) Sedimentation
7) Chemical Oxidation

Neutralization is found to be helpful when the waste is extremely alkaline or acid in nature. When the waste is to be discharged to a municipal sewer, it is imperative that it be neutralized prior to discharge *(4)*. The most economical method is one in which the acid and alkaline waste are mixed in proportions to bring the effluent within a pH range of 6-8. When the pH of the final waste reaches the 9-10 range, it may be lowered by treatment with flue gases. CO_2 from flue gases has been utilized in the treatment of dyeing wastes containing a large percentage of sulfur dyestuff by precipitating them from solution *(5)*.

Most textile dyeing and finishing plants produce wastes which are not constant in volume or character. Therefore, it is imperative that some means be used to equalize them prior to treatment or discharge to the municipal system. Retention basins capable of retaining wastes in an amount equal to the full operating day will prove to be the most satisfactory.

The use of chemical flocculants is the most effective method for the removal of color from textile waste; however, it is expensive and should be avoided whenever possible.

Aeration of effluents will oxidize re-

ducing agents in the waste, thereby reducing the immediate BOD. The activated sludge method, which incorporates aeration, may be found to be a very effective method of treatment.

Biochemical oxidation of textile waste on high-rate trickling filters is the most economical method of treatment from an operational standpoint. Hardy strains of organisms can be cultivated which will tolerate waste containing high sulfur-dyestuff concentrations and relatively high chromium and copper concentrations. At normal loadings good BOD reductions may be expected. After a good filter growth has been obtained, it is possible to allow wastes that vary somewhat in character to feed in without detriment to efficiency.

The clarification of the waste after treatment by sedimentation is necessary to prevent sludge accumulations on the bottom and banks of the receiving stream.

Chemical oxidation is sometimes used as final treatment for further BOD reduction and to oxidize coloring matter which is not affected by prior treatments. It may also be used for control of bacterial contamination of the receiving stream.

The above processes have been described very briefly to show some of the methods that may be used to treat textile waste. There are others, but these may be taken as the basic and most accepted methods of treatment.

SUMMARY

The technical staff of the average textile dyeing and finishing plant can handle the pollution abatement problem very effectively because of their knowledge of the wet processes and conditions existing at the plant. Therefore *they* should be best qualified to ascertain what can be done in the line of pollution abatement and waste treatment.

Pollution abatement can begin only after a thorough examination of the operations producing pollution and their waste. There are many ways of reducing pollution, e g, careful chemical controls and process changes along with education of the operating personnel (making them mindful of the pollution problem).

Waste treatment should never be undertaken without first instituting a pollution abatement program. It should not be necessary for a textile mill to be coerced into treating their waste without first making a complete pilot plant study of their waste to determine the most effective and economical treatment method. If the manufacturer takes the initiative in solving his own pollution problem, it is not likely that the regulatory bodies will make unreasonable demands upon them.

REFERENCES

(1) Rudolfs, Mangonelli and Gellman, *Sewage Works J*, 605 (July, 1949).
(2) Cox, L, *Am Dyestuff Reptr* 41, P228 (April, 1952).
(3) Marnon, D E, *ibid* 41, P292 (May, 1952).
(4) Nemerow, N T, *Textile World* 102, 151 (June, 1952).
(5) Murdock, H R, *Textile Inds* (August, 1951).

• PATENT DIGEST •

PAUL WENGRAF

PIGMENT DYEING—— Resin Pretreatment C, 4, 07

U S Pat 2,596,192
(Dan River Mills——Womble——
May 13, 1952)

Heretofore textiles dyed with pigment-resin formulations were limited to comparatively light shades in order to avoid crocking; moreover these light shades were found to be less bright than those obtained by standard dyeings with vats, azodyes, etc, as reported in the introduction to this specification.

A great improvement has been achieved unexpectedly by the current method, which consists of pretreating the fabrics before pigment-padding either with resin precondensates or with agents of the aldehyde group (e g, formaldehyde or glyoxal) that react with the vegetable fiber. Hitherto this kind of treatment had been suggested per se for crease-, shrink- or mildew-proofing purposes; but the fibers so treated were found to exhibit partial or complete immunization against most of the water-soluble dyestuffs. In contrast the aforementioned pretreatments were found to act as an ideal base for resin pigments padded on the goods in the form of an oil-in-water emulsion. A special advantage is that mixed fabrics can be dyed to an equal or almost equal level depth of shade according to the present method.

It is believed that the effect is due to a superficial deposit of the pigment resin composition around the pretreated individual fibers. The colorless resins seal the interstices and capillary spaces of the single fibers without closing the interstices between the threads of the woven fabrics. Consequently application of these resins together with the pigment emulsion in one bath has no effect at all.

Colorless resin precondensates used as pretreating agents include reaction products of melamine, urea or a ketone with formaldehyde. Alternatively the goods may be padded with acid (oxalic), formaldehyde or glyoxal. In any event, curing at 120-150° C must precede the padding procedure.

The pretreated fabrics are padded after curing to a pick-up of 75% with a commercial resin pigment concentrate, e g, 10% Sherdye Blue G2W to which some ammonia and sodium alginate are added, dried, cured for three minutes at 150° C, soaped at the boil, rinsed and dried. A checkered cotton-spun rayon fabric (pretreated) was dyed brilliantly and evenly while an untreated sample dyed with the same emulsion produced cotton yarns which were dyed only slightly, exhibiting an almost colorless checker design alongside the blue fibers of spun rayon.

Among other references cited by the Patent Office:

U S Pat 2,488,397 (Bancroft/1949—— cf *Am Dyestuff Reptr 39,* 201, (1950): preparing a fabric with a naphtolate, then printing with a fast color salt (e g, Fast Red Salt AL) mixed with the components of a thermosetting resin, drying, and finally glazing and curing at the same time to obtain colored glazed stable effects. The glazing effect of the background disappears in washing.

U S Pat 2,474,909 (Celanese/1949—— cf *Am Dyestuff Reptr 38,* 756 (1949)): a pigment-fixing process using a substituted biguanide (from ethylene diamine and dicyanodiamide), tartaric acid and formaldehyde (especially for delustering).

U S Pat 2,453,752 (Stein Hall/1948—— cf *Am Dyestuff Reptr 38,* 325 (1949)): printing with an oil-water emulsion. The oily (inner) phase comprises a vulcanized vegetable oil, such as rapeseed oil, in a water immiscible solvent; the outer (aqueous) phase, a hardenable resin preparation consisting of protein, urea and aldehyde.

U S Pat 2,444,468 (Armstrong Cork/1948): a linoleum-type surface covering having a cotton fabrics backing. A urea-formaldehyde treatment is given for protection from shrinkage, after which a wearing layer of a linoleum mix is applied to the backing and heated to effect

strong adhesion.

U S Pat 2,424,284 (Celanese/1947—— cf *Am Dyestuff Reptr 36,* 616 (1947)): delustering a fabric by first padding with an acid of a pH not less than 4, e g, tartaric acid, then printing with a pigment such as titanium dioxide with a paste containing formaldehyde and melamine and finally curing.

U S Pat 2,385,765 (Am Cyanamid/ 1945): finishing textiles wi h dispersions obtained from high substituted guanamines (stearoguanamine) and formaldehyde to obtain water repellent and (at the same time) softening effects.

U S Pat 2,185,746 (Arnold Print Works/ 1940); obtaining a permanent glaze (chintz) finish by first applying a temporary filler (optionally containing a catalyst), calendering and giving the fabrics on the smooth surface a coating with a hardenable resin.

The inventor is aware that resin pretreatments have been suggested for increasing the affinity of acid dyes for cellulosic fibers (animalizing). The present process differs from this in that it calls for applying the coloring matter from an emulsion, thereby excluding principally the use of the resin preparation as a mordant.

DYEING WITH INSOLUBLE AZODYES—— Stabilizing Naphthol Solution with Polyamine Condensates C, 4, 03

Brit P 671,979 (Danner——Zerweck—— May 14, 1952)

It is known that naphtholate solutions for preparing ice-colors are generally unstable, precipitating after a short time and becoming useless for impregnating.

The inventors observed that this drawback can be overcome by adding small amounts of polyalkylene polyamines condensed with halogen-carboxylic acids to the standard halides, e g, ethylene chloride, with ammonia and removing the lower molecular weight amines by distillation. This step in itself is not protected by the present patent.

In the second step of this process alkylcarboxylic acids are combined with the higher molecular polyamines by using monohalogenated carboxylic acids, such as monochloroacetic acid as reactants. The final products are characterized by the formula R_2N- (alkylene-$NR)_n$-alkylene-NR_2. At least one of the R's is an alkylcarboxylic group, the other R, hydrogen, or two of them alkylene; n is at least 20. The substance is built up of chains -NH-C_2H_4-N-C_2H_4-N-. The ratio of carboxylic groups to nitrogen is 1:3, 1:4, or 1:5, i e, there are always present more N-atoms than acid groups. The final products can therefore be termed as polyethylene polyglycines.

Example: a solution of the polyethylene polyglycine is made alkaline and mixed with an aqueous solution of naphthol pasted with alcohol and caustic plus some formaldehyde. This impregnating bath reportedly remains clear even after 24 hours standing.

Two examples refer to Naphthols AS-SW and AS-ITR respectively, but the invention is not restricted to a special Naphthol brand.

Reference is made to Brit P 446,813 (I G Farbenind), in which it is suggested that products obtained by reacting higher amines with halogen carboxylic acids be used as cleaning or dye-dispersing agents.

AGER for Developing Vat Dyes in Two Separate Chambers D, 5

Swiss Pat 276,696 (Benz——Oct 16, 1951)

This patent refers to a well-known fixing device for vat dyes, generally known as the "Electrofixer" (see references below). This apparatus is based on the principle of carrying out the development of vat prints in two distinct phases: 1) reducing the vat dye of the paste to the leuco compound at a relatively high temperature and quite suddenly by leading the moist fabric over electrically-heated units and 2) by causing penetration of the leuco vat dye at a distinctly lower temperature (one suitable for locally dyeing the fibers in the printed areas).

Unsatisfactory results from this method may be caused by the difficulty in maintaining two different temperatures in one chamber. Reduction, it is claimed, may best be effected in an air-free steam atmosphere, preferably 100° C, while this temperature is unsuitable for the second (fixing) step. The problem is solved according to the current invention, by carrying out the operation in two separate chambers, the first (D_1) filled with steam developed in (B) and heated by infrared radiating units (U), and the second, fixing chamber (D_2) heated by (H). Excess steam is carried along with the goods from D_1 to D_2. Both chambers are fitted with heating and moisture-controlling devices of customary types.

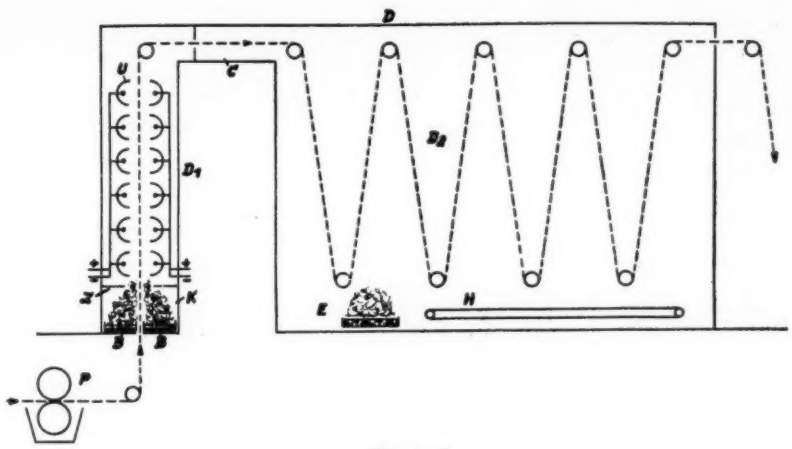

Figure 1
Swiss Pat 276,696

References:

Brit P 421,237 (I G Farbenind) describes the "Electrofixer" as a chamber containing a heating element which can be adjusted to a certain temperature (below 100° C in this case) and a humidifier. The goods cool down after passing the heating unit so that the leuco vat dye is fixed on them at a temperature below the reducing temperature. Optionally, a second device (not shown in the drawing) may be provided to prevent the goods from cooling too rapidly, the optimum difference between the temperatures being about 20° C.

Co-pending Brit P 421,279 explains the chemical principle used in the device mentioned above: the reduction of the vat dye on the moistened goods has to be effected as suddenly and rapidly as possible (at about 70-80° C). The goods have to be removed as soon as they have attained the temperature desired and brought to about 50° C, i e, the optimum fixing temperature for the leuco vat dye formed.

Thus the "Electrofixer" operates on the principle of a sudden reaction, limited to a relatively small area. Obviously the cooling for fixation occurs very fast in this event. In contrast, the present process uses overheated steam reduction in a conventional ager (D_1 in the illustration). In this event it might be necessary to carry out the operation in two separate, controllable steps to avoid excess heat in the fixing phase.

ABSTRACTS

Dielectric Heating and Drying of Textiles

Alexander and Meek, *Melliand Textilber,* 163 (Feb, 1952) and 229 (March, 1952).

The authors initially describe the difference between heating or drying textiles from the outside in standard drying equipment and dielectric heating, which generates heat within the goods. The latter method avoids overheating of the surface, permitting unlimited speed in the drying process. The theoretical principle underlying dielectric heating is explained and application of this method on drying textiles is described.

The wet goods are carried, by an insulating conveyor belt, between two condensor plates of copper or aluminum that form an electric alternating field of very high frequency. Humidity, amount of electricity used and temperature generated within the dried specimens during the process are plotted in curves. Three distinct phases occur: 1) rapid warming up, 2) constant decrease of moisture, and 3) abrupt decrease of the drying speed. This breakpoint of the curve varies widely with different textile materials. According to these experiments, wool and Terylene (Dacron) fibers can be dried well by this method. They are not apt to be destroyed by overheating in contrast to cellulose or nylon which can be slightly damaged under uncontrolled conditions.

Advantages of the process: heat may be generated exclusively in areas where it is used up for uniformly warming the water contained in the goods, the process can be easily controlled and heating can be interrupted at any moment.

Among the interesting applications in the textile field are the drying of urea-formaldehyde impregnated textiles while avoiding the accumulation of resin concentrations on the surface, drying heavy felts for the paper industry, or drying heavy carpets which otherwise are easily damaged by prolongated heating from the outside.—PW

Dyeing Halfwool with Benzo Fast Copper Dyes

Wojatschek, *Melliand Textilber,* 151 (Feb, 1952).

Benzo Fast Copper dyes form a water-resistant lake in copper salt aftertreatment, reportedly improving lightfastness and fastness to water at the same time. Acid- and meta-chrome dyestuff brands that can be combined with Benzo Fast Copper dyes are enumerated; a table gives the characteristics of a series of these dyes with respect to their tolerance to hard water, behavior in halfwool dyeing, etc; suggestions are given to improve levelness in dyeing mixed materials; and formulas that have proved successful in practice are offered.

Quite generally an aftertreatment with copper acetate mixed with Levogen W W is advocated, which gives best water fastness, though milling fastness decreases at the same time. In the latter event, alkalinity of the bath has to be carefully controlled. Application of Benzo Fast Copper dyes is said to be easy and fastness to water, washing, perspiration and sea water (except for alkaline fulling), very satisfactory. The usefulness of the dyes for all forms of sliver, yarn, woven or knitted mixed fabrics is stressed.—PW

Methylcelluloses and Cellulose-glycollate in Finishing Processes

Jahn, *Textil Praxis,* 299 (April, 1952).

Alkylcelluloses, under the tradename "Tylose", were initially offered to the trade about 20 years ago. The name "Tylose" was later extended to carboxymethylcelluloses (known in the United States as C M C, Methocel, etc). Experiences with this type of finishing agents are outlined in this article.

Methylcelluloses of low viscosity and those optionally diluted are more stable to heat than highly viscous brands and concentrated solutions. They may be precipitated by tanning agents, silicates, phosphates and anion-active agents but not by cation-active substances. Solutions of this type can be used for weeks when properly prepared in contrast to starch compositions that are subject to acid decomposition and mildew. The higher methylated celluloses (3-4 alkyls per one cellobiose chain) are of maximum water solubility while "Tylose 4S", a lower alkylated product, is alkali soluble only, thereby permitting acid precipitation and insolubilization on the fiber. Practical formulas for preparing durable finishes by using sulfuric acid and Glaubers' salt also acetic acid as precipitating agents are offered.

Carboxymethylcellulose is available in "Tylose" brands: MGC 600 (high viscosity) and MGC 25 (low viscosity) and CO. MGC does not react with standard filling agents, such as magnesium salts. Neutral CO (composed of about 35% sodium cellulose glycollate and 65% common salt) is especially recommended for applying stiff finishes on white goods, and also for printed fabrics, poplins, table cloth, etc. It is suggested that pad dyeing be combined with these finishes since direct dyes are carried uniformly by the homogenous mass. The cellulose glycollates are generally more resistant to precipitating agents than Tylose 4S, for example. The latter can be used for padding in alkaline solutions with "Anthrasols" (soluble vat dyes), developing and precipitating dye and alkylcellulose at the same time with acids.—PW

Qualitative Tests for Synthetic Fibers

Ulrich, *Textil Praxis,* 150 (Feb, 1952) and 211 (March, 1952).

Synthetic fibers discussed in this article include the polymer fibers (Vinyon, Orlon, Polythene), polycondensates (nylon, Perlon, Dacron), polyadditional condensates (polyurethanes) and synthetic fibers impregnated with other artificial compounds, such as the "Plexon" yarns. The author reports on characteristic properties of these filaments———their natural color, cross-section, swellability or solubility, behavior in burning, densities, dry distillation (which is apparently characteristic of the filaments of various groups), luminiscence in ultraviolet light, tests for chemically bound Cl-, N- or acetyl groups, saponification with alcoholic potash or ethylglycol potash (especially for Vinyon, Orlon, Saran or fibers containing one of the aforementioned sidegroups), dyeing tests with special dyestuff mixtures, with Ninhydrine, iodine, solubilities in various organic or inorganic reagents (particularly applied to polyamide fibers), melting and softening points, etc. Valuable first hand information can be obtained by use of the comparative tables contained in the text.—PW

Accelerated Light Fastness Testing Methods

Rabe, *Textil Praxis,* 148-50 (Feb, 1952).

The author briefly explains the action of light of different wave lengths on dyed goods. Infra-red rays contained in sunlight are chiefly responsible for dyestuff destruction while the ultraviolet rays (present in a relatively small amounts) exert lesser reactions. It is concluded that results obtained while using a testing apparatus with artificial light, e g, with Quartz-

Mercury-Lamps containing a high percentage of ultraviolet rays, do not correspond with those obtained by natural insolation.

Some dyes rapidly destroyed by U V light proved to be acceptable in normal dyeing practice while other brands, such as Auramine, Triphenylmethane dyes of the Acid-Fuchsine- or Acid-Violet class, etc, were attacked less by U V rays than by normal sunlight carrying greater quantities of visible and infrared rays. This has a tendency to lead to erroneous conclusions regarding their practical light fastness. The same is said to be true of other equipment such as the Fade-O-Meter (Atlas Electric Devices). Results obtained here have been checked by Toussaint, Zuber, Niederhauser and Morton with parallel results in normal sunlight; in about 70% of these tests more or less distinct differences could be noted indicating that the equipment has to be carefully controlled and that coal in the arc lamps has to be replaced daily. Other apparatus, based on similar principles (e g, the "Fugitometer") are discussed.

About 20 years ago Cassella-Works (of former I G Farbenind A G) developed an apparatus that proved successful. The coal arc lamps are replaced by low-voltage Osram lamps with special filter screens emitting light rays almost identical with sunlight. Cooling and air-moistening devices (to 65% rel humidity) are inserted. These light fastness tests require a longer time than those made with coal arc lamps but results seem to be more reliable.

A new device called "Heliotest", developed by Zukriegel and Gasser, is based on the action of solar light intensified by a special lens system.—PW

Testing Resins Used in Crease-proofing Rayon

Kraner & Graeser, *Melliand Textilber*, 226 (March, 1952).

Several tests have been proposed for demonstrating the distribution of resins in creaseproofed textiles. Refractive indices of the rayon material and of the resins applied are very close precluding a resin determination on this base. The Northern New England Section of AATCC (*Am Dyestuff Reptr* 35, P13 (1946) advocated dyeing the impregnating resins with Anthraquinone Blue BN; other authors recommended acid dyes, such as Disulfine Blue VNS (Alexander), etc. Bernegger (*Textil Rundschau* 191, (1948)) suggested that the resins be made visible by alkaline decomposition of the finish and that the liberated formaldehyde be reacted with ammoniacal silver nitrate (Tollens solution). The authors criticize this method particularly demonstrating (on fiber cross sections as well as on finished fabrics by comparing microphotographs) that this reaction is less characteristic than the reaction with Kitone Fast Blue V (Schultz Farbstofftabellen #769 or CI #672) for making visible the resin portion incorporated in the fabric. The first publication by Eloed in *Melliand Textilber*, 461 (1940) is mentioned. Impregnations with melamine resins and "Kaurit DD" were subsequently examined and found to give analogous reproducible results (cf *Am Dyestuff Reptr 41*, 311 (1952) abstracting Graeser's article in *Textil Praxis*, 823 (Nov 1951).—PW

Equipment for Condensing Resins on Fabrics

Hagen, *Melliand Textilber*, 234 (March, 1933).

Physical conditions in drying resin-padded fabrics to obtain uniform condensation within the fibers have not yet been sufficiently studied. Resins have the property of migrating to the drying surface, i e, to the portions close to the heated metallic drum or——in tenter frames—— to the entrance of hot air blown against the material. It is essential to blow the hot air against both sides equally and across the entire width of the impregnated fabrics and also to keep temperatures low during the drying process proper to avoid premature polymerization in this stage. Subsequently the dried fabric has to be warmed throughout the whole material to effect uniform curing. Infrared radiation is used in two separate chambers in the curing process, first to warm the fabric rapidly to the temperature necessary for resin formation and secondly, to keep this temperature constant for about three minutes until the fabric leaves the condensing device. Appropriate equipment is described and illustrated.—PW

Cotton's Minor Constituents: Their Role in Utilization

C L Hoffpauir, *Textile Inds* 116, 109-12, August, 1952.

If the manufacturing operations for producing finished goods from cotton are to be improved, a better understanding of the nature of the fiber's minor constituents is essential.

As very little attention has been given in the past to the complete analysis of individual samples, the chemical composition of 6 commercial raw cottons was investigated, quantitatively, by Southern Laboratory scientists to provide basic information about the nature and amounts of constituents in the fiber. A typical analysis of the mature cotton fiber is given, as follows:

Constituent	%
Cellulose	94.0
Protein	1.3
Pectic Substances	0.9
Ash	1.2
Wax	0.6
Malic, Citric, and other organic acids	0.8
Total sugars	0.3
Pigment	Trace
Other	0.9

The information thus far obtained about the minor constituents of cotton, although fundamental in nature, has considerable practical significance. For example:

Wax in cotton serves as a lubricant for the fiber and is necessary for proper preparation of cotton for spinning. If wax is removed, cotton accumulates static electricity. Removal of the wax after the yarn is spun increases the tensile strength of yarns and fabrics.

Protein in cotton appears to have only minor effect on the dyeing properties; however, a high content of nitrogen in finished fabrics, due to poor scouring, is said to favor damage by bacteria and molds.

Ash alkalinity and pH are useful indices of extreme field deterioration.

About 85 per cent of the ash may be removed from the fiber by extraction with water, but most of the calcium, magnesium, iron, and aluminum remain.

Total sugar content ranges from 0.05 to 0.25 per cent; however, these materials are soluble in water and are removed in scouring.—WHC

Analysis of Staple Fiber Mixtures

D C Fisher and E D Roberts, *Textile Research J* 22, 509-12, August, 1952.

Methods have been developed for the qualitative and quantitative analyses of staple fiber blends containing acetate, Dynel, wool, nylon, viscose rayon, cotton, Orlon acrylic fiber, and Dacron polyester fiber in any combination. The qualitative analysis involves determination of density and microscopic appearance; the quantitative analysis employs selective solvents.

It is expected that blends having more than three constituents will be encountered only rarely, if at all. However, the method outlined for the quantitative analysis of these fibers is designed to allow the complete analysis of a blend containing all eight fibers. After the qualitative composition of a blend has been established, the quantitative scheme may be followed with the omission of those steps dealing with fibers known to be absent.

For the qualitative separation, the fibers are divided into the following three density groups by the use of a density gradient tube:

	Density Range
(a) Orlon, nylon, Dynel	less than 1.30 g/ml
(b) Wool, acetate, Dacron	1.30 to 1.40 g/ml
(c) Rayon and cotton	1.45 to 1.55 g/ml

Fibers in each density group can be further distinguished easily by their microscopic appearance.

The specific solvents used in the quantitative analysis are as follows:

Acetate	80% acetone
Dynel	100% acetone
Wool	Sodium hypochlorite
Nylon	Formic acid
Viscose	Conc hydrochloric acid
Cotton	70% sulfuric acid
Orlon	Ammonium thiocyanate
Dacron	40% sodium hydroxide

The methods presented in this paper are suitable for the analysis of most blends in use at the present time. The nature of the methods presented is such as to permit extension by suitable modifications for use in the detection and determination of other fibers also.—WHC

Degradation of Nylon on Exposure to Light

Anon, *Textile Age* 16, 33-5, September, 1952.

Nylon yarn, like other textile fibers, is subject to degradation on exposure to light. Prolonged exposure causes a loss in strength and elongation and affects other properties of the yarn, but does not cause discoloration of the nylon. The degradation is due primarily to the effect of light in the visible violet and blue range of wave lengths.

Data from sunlight exposure tests indicate that bright nylon yarns have essentially the same sunlight durability as cotton, linen, and bright rayon yarns of the same denier; better sunlight durability than silk and dull rayon yarns; and poorer durability than Orlon acrylic fiber.

Bright nylon is considerably more resistant to sunlight degradation than semidull nylon. High denier per filament fibers are more resistant than low denier per filament. The rate of deterioration of nylon may be appreciably affected (increased or decreased) by the presence of dyes, finishes, and other agents in or on the fiber.

Nylon has slightly better resistance to sunlight when exposed behind window glass than when exposed outdoors. Sunlight deterioration is more rapid at certain locations than at others. At most, but not all, locations in the United States, deterioration is much more rapid in summer than in winter, as will be seen from the following table:

TIME REQUIRED FOR EQUIVALENT DEGRADATION OF NYLON

Month	(Outdoors) Wilmington	Weather-Ometer
January	10 weeks	100 hours
February	8 weeks	100 hours
March	3.6 weeks	100 hours
April	1.0 week	100 hours
May	0.9 week	100 hours
June	0.8 week	100 hours
July	0.8 week	100 hours
August	1.5 week	100 hours
September	2.5 weeks	100 hours
October	4 weeks	100 hours
November	7 weeks	100 hours
December	9 weeks	100 hours

In testing products, such as tents, tarpaulins, sails, flags, etc, where light resistance is obviously important, degrading factors other than light should also be considered. In many cases these other factors may cause more damage to some of the textile fibers than light. Examples are mildew and mold, industrial fumes, smoke from burning fuel, constant flexing, abrasive wear, and sand carried by the wind.—WHC

Use of Sulfamic Acid Derivatives in the Application of Oxidation Blacks

C Zuber and B Jomain, *J Soc Dyers Colourists* 68, 241-8, July, 1952.

The oxidation blacks, especially aniline black, have played an immense part in both dyeing and printing. Owing to its fastness and its low cost of production aniline black has been able to maintain its place in the age of anthraquinone and azoic dyes.

Nevertheless, these oxidation blacks have not been without defects. For a long time they had a great tendency to take on a disagreeable green shade. Another defect, at least as important, and common to all the oxidation blacks, is the serious risk of weakening of the cellulose fiber during processing. Finally, the print pastes themselves are unstable, and they are quite difficult to use in conjunction with other classes of dyes.

It was logical to think that certain of these defects might be avoided by using, instead of the bases themselves, which are soluble only in an acid medium, derivatives which can be dissolved in neutral or alkaline media and which, in spite of that, will condense on oxidation.

The conversion of a primary amine $R.NH_2$ into an alkali-metal sulfamate $R.NH.SO_2Na$ indeed offers the possibility of making the original amine soluble in an alkaline or a neutral medium. The solubilizing group SO_2Na has the additional property—and this is particularly useful—of being easily eliminated by acid treatment, preferably warm. It does not prevent the rest of the molecule from undergoing oxidation to a black; i e, the sulfamate corresponding to an amine giving rise to an oxidation black may itself be oxidized and form the same dye.

Numerous trials have proved that the sulfamates of certain amino derivatives of diphenylamine are oxidized in a simpler manner than aniline. In other words, it is easier by this method to obtain an oxidation black from aminodiphenylamine than to produce an ordinary aniline black.

It is thus possible to obtain a product of good solubility in a neutral medium which is capable of being easily oxidized and thus giving rise to a good ungreenable black, which does not attack the fiber provided certain simple precautions are taken.

One of the aminodiphenylamine sulfamates, known as Solanile Black, is of particular interest in printing, for with it one can obtain deep blacks of excellent general fastness on cellulosic and union materials, and it can be used either alone or side by side with many other types of dye and even in combination with some of them. It is in printing that Solanile Black is most useful, in particular in all cases where aniline black would cause severe degradation of the fiber, as on delicate viscose rayon materials.

The author gives complete instructions for preparing and applying the Solanile Black printing paste, which they state may be kept for weeks. The black may be developed by either neutral or acid steam. The shade obtained is ungreenable without use of dichromate, which is essential in the case of aniline black. Finally, there is said to be no appreciable tendering of the fiber.—WHC

Alginate Fibers: the Position to Date

Anon, *Textile Inds & Fibres* 13, 180-184, June, 1952.

Alginic acid, which is one of the main constituents of seaweed, consists of very long-chain molecules with reactive side-chains (carboxyl groups). Solutions of sodium alginate (in which the carboxyl groups have been converted into COONa groups) are readily soluble in water, and being very viscous, are highly suitable for spinning into fibers. They can readily be converted to alginic acid by spinning into an acid bath, or to calcium alginate by spinning into a coagulating bath containing calcium salts.

The alginic acid filaments are fairly satisfactory as regards strength, but unfortunately they will dissolve in a few seconds in a solution containing 0.2 per cent of soap and 0.2 per cent of soda ash, so that they will not stand up to an ordinary scour or wash. The calcium alginate filaments are not much better, and are unsuitable for the great majority of textile purposes. Because of this difficulty, investigation has been made of the properties or other alginates in the hope of finding one that would satisfactorily withstand the action of alkaline scouring baths.

The alginates of chromium and beryllium resist the action of dilute alkalis, but chromium alginate is green in color

and beryllium alginate is toxic. Aluminum alginate, which is probably the best that has yet been made, has a much higher wet strength than calcium alginate, and it can be washed repeatedly and safely in neutral or nearly neutral soap solutions; it has, however, a low extensibility. It provides what is at present the only fabric suitable for apparel which is both flameproof and washable, and it has the advantage that both aluminum salts and seaweed are abundant.

The solubility of calcium alginate in dilute alkali has been turned to advantage in several ways. Calcium alginate yarn may be twisted with very fine worsted yarn, and when the fabric has been woven, the alginate fiber is removed by scouring, leaving a very fine worsted fabric. A similar principle is involved when socks are knitted in a "string", if a few rows of stitches of calcium alginate yarn are inserted between the socks. Various novelty fabrics and yarns have been made by similar methods, using calcium alginate as a disappearing fiber.

Alginate fibers have affinity for basic and selected direct dyes, and the aluminum alginate may be dyed directly with mordant dyestuffs.

The method of extracting alginic acid from seaweed and of spinning the alginate fibers is described.—WHC

Ethylene Oxide Derivatives

(Continued from Page 732)

The inhibiting effect of the addition of ethylene oxide condensates is well illustrated by the following experiment:

20 cc of a soap solution containing 7% oleic acid saponified with soda is diluted to 40 cc with distilled water. To 5 cc of this solution is added 95 cc water containing 700 ppm hardness. A flocculent precipitate of lime soap is formed.

The experiment is repeated, using the same 7% oleic soap solution to 2 cc of which 5 cc of a 1% solution of Product A is added. This mixture is diluted to 40 cc. As in the first experiment, 95 cc of water containing 700 ppm of hardness is added to 5 cc of this solution. No precipitation of lime soap occurs on account of the protective action of Product A in the solution. Even more hard water can be added without any sign of precipitation.

The protective property of Product A was compared with that of other surface active agents by the author. The results are shown in Table VI.

According to Table VI, 22.5% sulfonated lauryl alcohol is required to inhibit the precipitation of lime soap as against 2.5% Product A; both percentages calculated on the weight of the soap, which contains 70% oleic acid. In the case of the highest addition of hard water, a precipitate was formed in the case of the sulfonated lauryl alcohol whereas there was no precipitation in the case of Product A.

This experiment shows the advantage of adding ethylene oxide condensation products not only to the soap baths but also to the rinsing water after soaping, in order to prevent formation of lime soaps. In addition to their use as assistants in soap baths, ethylene oxide condensation products are themselves good detergents. They are used for scouring woolen piece goods and for raw wool scouring.

From the foregoing detergency experiments shown graphically in Table IV, it is apparent that, before selecting a nonionic ethylene oxide condensation product for wool scouring, a thorough study must be made as to the suitability of the product for this particular application, and that it must have the correct degree of condensation.

TABLE V
RESIDUAL FAT ON WOOLEN CLOTH CONTAINING ORIGINALLY 5% FAT, AFTER WASHING AT 40-45°C FOR 30 MINUTES IN SOFT AND HARD WATER

Residual fat %		*Detergent 5 g per l*
Hard Water	*Soft Water*	
0.5	0.45	Product A
4.5	1.40	Soap containing 65% fatty acids

By using a product of the type of Product A it is possible to carry out the operation of fulling wool in neutral bath and to get very satisfactory results in the subsequent washing operation.

The fabric is soaked with a solution containing 1 - 3% Product A on the weight of the goods and is then fulled without any addition of soda or soap. It is then taken to the washing machine and washed with plain water without any other addition. Neutral fulling prevents any staining of any white threads in the woven fabric and maximum increase of weight is obtained. This method of fulling is well adapted for military cloths, which must be heavily fulled and should have good resistance to stretching.

A particularly important use for nonionic detergents is in the scouring of grease wool. Nonionic detergents used for this purpose act in a unique way and must be applied at relatively high temperature (60 - 70°C). Under these conditions of temperature, their solubility in water is reduced, while their affinity for fatty matters is increased. The nonionic detergent is attracted to the fatty matter and clings to it. In the succeeding rinsing bath, which is at a lower temperature, the solubility in water of the detergent increases again and the grease passes into the rinsing bath with it in the form of a stable emulsion.

The first detergent studied particularly for wool scouring was a condensation product of ethylene oxide with oleyl alcohol. It was made about the end of 1936 in Ludwigshafen; however, it was not until during the war that any significant development in the washing of wool with nonionic detergents took place in Germany, and only recently has it been taken up in other countries.

The difficulty in introducing this method of wool washing is the necessity of accurate study to determine the best method of procedure and the selection of the most suitable ethylene oxide condensation product and the fact that the washing must be done at a comparatively high temperature.

In the case of entirely synthetic detergents, such as one made by condensing 8 moles of ethylene oxide with an alkylated β-naphthol (hexyl-octyl), it is possible to conduct the washing at lower temperatures (50-60°C) while with the first-mentioned product it is necessary to work at 70°C.

According to recent researchers (*4*), it would be highly advantageous to wash in an acid bath, so that it would be possible to operate at lower temperatures, because the presence of acid in solutions of ethylene oxide condensation products lowers the temperature at which they become turbid. The same result can be obtained by adding soluble salts to the baths; moreover, say the German researchers, by working in acid bath, particularly at the isoelectric point of wool, a finer grade of wool is obtainable. They also recommend

TABLE VI

Auxiliary Used	*Number of grams of auxiliary required per 100 grams soap to inhibit precipitation of lime soap*	*Degree of dilution with hard water of 700 p.p.m. of 5% soap solution*	
		1:20	1:100
Product A	2.5	no ppt	no ppt
Product B	4.5	no ppt	no ppt
Sulfonated alcohol 60% active	22.5	no ppt	ppt
Alkylaryl sulfonate 100% active	42.5	no ppt	ppt

that the problem of corrosion of the iron parts of the scouring machine by the acid solutions can be overcome by painting them with an acid resistant varnish.

According to the reports of the Allied Commissions on German Industry, wool was washed in Germany during the war with nonionic detergents in neutral or very slightly acid baths (pH 6.5 to 7); soda alone was used in the first bowl. See also (5).

Using a 5-bowl wool scouring traine, the operation was carried out as follows: The first bowl contained a small quantity of soda; the second and third bowls contained the nonionic detergent; the fourth and fifth bowls contained the rinse water. The temperature in the scouring bowls was 55 - 60°C, that of the rinse water was 45°C.

According to the Germans the washed wool scoured in this way is softer, whiter, does not yellow on drying and dyes better than wool scoured in the conventional way.

3. SOFTENERS

Condensation products of ethylene oxide with fatty acids, amides and amines are used as softeners for rayon and other synthetic fibers. These products almost invariably contain the fatty radicle of stearic acid and have a low degree of condensation. They are dispersible but not soluble in water. The principal nonionic softeners derived from ethylene oxide are represented by the following formulas:

I $C_{17}H_{35}COO.CH_2CH_2N.(CH_2CH_2O.CH_2CH_2OH)_2$

II $C_{17}H_{35}CON.(CH_2CH_2O.CH_2CH_2OH)_2$

III $C_{17}H_{35}CON.CH_2CH_2CH_2OH$ + molecules of ethylene oxide

These three products are obtained by condensing stearic acid with tri-, di-, and monoethanolamine and afterwards condensing with ethylene oxide. They are softeners which give a soft and wooly hand to rayon; the last two can be used with basic colors.

Another softener

$[C_{17}H_{35}CON.(CH_2CH_2O)_6H]$

gives a silky hand to rayon; it is also used in spinning viscose rayon.

4. DYEING ASSISTANTS

Certain condensation products of ethylene oxide with fatty substances are used in dyeing as wetting and leveling agents.

A prerequisitive for level dyeing is the uniform wetting of the entire surface of the material being dyed by the dye liquor. If the material being dyed has not been perfectly scoured, it is necessary to add to the dyebath a wetting agent.

In the case of wool dyeing, which takes place in an acid bath, it is necessary that the wetting agent shall resist acids. One product, a condensate of ethylene oxide with oleyl alcohol, which is resistant to acids, makes it possible to carry out the operations of dyeing and scouring simultaneously.

Condensation products of fatty alcohols with 20 - 25 molecules of ethylene oxide, in addition to good wetting qualities, exhibit also very good leveling properties.

In order to understand the leveling action of these products, it must be remembered that the dyeing is much more uniform when the coloring matter is absorbed slowly by the textile fiber. Condensation products of the fatty alcohols (lauryl, cetyl, oleyl, stearyl) with a varying number of molecules of ethylene oxide, according to the particular alcohol being used, act as retarding agents in dyeing with substantive and vat colors. Valko (6) and Schwen (7) have shown that these condensation products have no affinity for the textile fibers but they have affinity for the dyestuffs and have the property of agglomerating the molecules of coloring matters forming agregates which disperse more slowly than the single molecules. The velocity of absorption by the fibers is reduced thus promoting level dyeing.

In the case of vat colors, the leuco compounds are aggregated and their ability to penetrate the fiber is reduced. Schwen says the agglomeration of the dyestuff or leuco compound molecules is caused by the residual valency forces of the ether compounds. Wurzschmitt (loc cit) however, states that condensation products of fatty alcohols with several molecules of ethylene oxide form cation-active polyoxonium hydroxide by dissociation in water.

$$R.O.CH_2(CH\,OCH_2)_x\,CH_2OH + \chi H_2O \rightleftharpoons (R.O.CH_2(CH_2OCH_2)_x\;(CH_2OCH_2)_y\,(CH_2OH)_x\,(OH)_x$$

Such complexes are capable of reacting with the anions of the dyestuff or of the leuco body to form more or less soluble and stable cation-anion active compounds. This would explain why the addition of anion active agents or an alkyl sulfonate neutralizes the action of the polyoxyethylene retarding agents. The anions would form a very stable polyoxonium salt with the hydropolyoxonium derivative liberating the weaker anions of the dyestuff or leuco body.

The polyoxyethylene compounds are also useful assistants in stripping vat colors from fabrics that have been dyed too dark or unevenly dyed. The stripping is done with hydrosulfite and the auxiliary, the latter product being used in excess with the idea of forming aggregates of the leuco compound that are too large to be reabsorbed by the fiber. The hydrosulfite converts the dyestuff on the fiber into the leuco compound; an equilibrium takes place between the leuco compound on the fiber and the leuco compound in the stripping liquor. The leuco compound that passes into the liquor is fixed into large agglomerates by combining with the polyoxyethylene compound which cannot be reabsorbed by the fiber. In this way it is possible to attain considerable stripping of the color.

Condensation products of fatty alcohols with ethylene oxide are very good assistants in the dyeing of naphthol colors. They are added to the developing (diazo) bath and promote very uniform deposition of the insoluble particles of the diazo compound on the naphthol prepared goods. The low resistance to rubbing of naphthol colors, which is caused by the presence of coarse particles of pigment on the fiber, can be markedly improved in this way.

The dispersing action of the polyoxyethylene compounds can be advantageously used in dyeing acetate fibers (8). According to Corbiere, Director of Research at the Societe Rhodiaseta Frances the best results are obtained in dyeing acetate with addition of the condensation product of castor oil with 40 moles ethylene oxide.

TABLE VII

Color g per l	*NaCl g per l*	*Auxiliary g per l*	*Molecular weight of particles*	*Degree of Aggregation*
0.05	1.17	1	124,000	125
0.05	1.17	1	2,700	3
0.05	1.17	1	8,450	8.5

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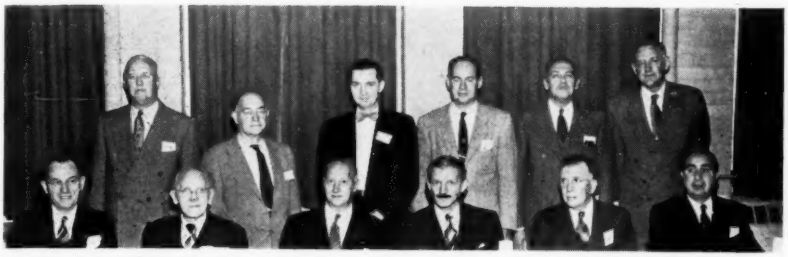
NEWS



Those seated at the head table during dinner at the recent dedication ceremonies of Fairleigh Dickinson College's new textile building included: Seated (l to r): William C Planz, Hesslein Co; Ralph Ross; Henry Heinbockel, Hesslein Co; Prof Lloyd Haberly, Fairleigh Dickinson College; George W Walker, Hesslein Co; President Peter Sammartino, Fairleigh Dickinson College.
Standing (l to r): A J Royce, Sr, Royce Chemical Co; Warren L Duncan, industrial coordinator at FDC; William Fewkes, Director of the Evening College; Prof Harold Feldman, Business Dept, FDC; Prof Herbert Mauersberger; Paul J Luck, Calco Chemical Division, American Cyanamid Co.

• New FDC Textile Building Dedicated

Dedication ceremonies for Fairleigh Dickinson College's new Hesslein Textile Building were held on October 16th at Rutherford, N J. Following the placing of the cornerstone, guests from industry made an inspection of the building, with FDC textile students acting as ushers.

Dr Peter Sammartino, cresident of the college, reviewed briefly the history of the building, paying tribute to the assistance given by the faculty and by the Textile Advisory Board. He told of the impetus provided by the Hesslein Foundation toward construction of the building with its gift of $50,000, and described the cooperation of many of the industries in the area through contributions of money and equipment. One piece of machinery recently donated was a tensionless continuous dye beck by Dr R M Nazzaro, President of American Textile Processing Company and Ten-Co Machine Company, Paterson, N J.

The Hesslein Textile Building is the fifth building on the Fairleigh Dickinson campus. The first floor contains a textile machinery room, a preparation room, a conditioned room for testing purposes, a laboratory for textile chemistry, and a large demonstration room. The top floor contains five spacious class rooms.

Seven textile courses are currently offered by the college. Day students may elect to study textiles for two years, leading to an Associate in Arts degree in textiles. Students in merchandising, chemistry and hotel management at the college can choose these courses as electives and for specialization. A new four-year course, leading to the BS degree in chemistry, with a textile option, is also being offered.

After ceremonies at the new building, the guests adjourned to the student lounge in the College Commons where dinner was served. Following dinner there were brief addresses by Dr Sammartino, Professor Herbert R Mauersberger, director of the textile department of the college, and George W Walker, president of the Hesslein Company, and trustee of the Edgar and Emily Hesslein Memorial Fund, Inc.

Invited guests from industry included B Allison, Tuscony Fabrics; George Apsey, Jacques Wolf & Co; Carl H Brubaker, Standard Bleachery; F L Bume, Tennessee Eastman; A V Caporossi, Morrison Machine Co; N C Caress, Waldrich Bleachery; W W Chase, Interchemical Corp; Harry Cohen, Cascade Laundry; George R Decnyf, Jr, United Piece Dye Works; M C Galanti, United Piece Dye Works; L L Grombacher, Standard Chemical Products; H Heinbockel, Hesslein Co; D Hoffman, Jacques Wolf; Roger Horelbeke, Ten-Co Machine Co; G H Jonic, Calco Chemical Division; Paul Luck, Calco Chemical Division; W C Planz, Hesslein Co; A J Ramunda, Refined Products Corp; Ralph Ross; Arthur Roth, General Dyestuff Corporation; W J Rothemich, Interchemical Corp; A J Royce, Sr, Royce Chemical Co; S S Sinatra, Refined Products Corp; H J Starke, Hesslein Co; B S Schwartz, Colgate Piece Dye Works; Joseph Spevack, Scientific Dye, Ltd; E I Stearns, Calco Chemical Division; Byron L West, Calco Chemical Division; Ralph Zoccolillo, Refined Products Corp.

Faculty guests included: Herman Baumann, Clair W Black, Henry C Clement, Harold Feldman, Luduwig Fusser, Lloyd Haberly, Dean Ray A Miller, Howard R Mirkin, M J Pagerie, and F S Richardson.

Prof Herbert Mauersberger displays his architectural prowess in the laying of the cornerstone at the Hesslein Textile Building.

• Colored Smoke in Skywriting Introduced

The first commercial use of colored smoke in skywriting was introduced on Columbus Day when an advertising message in yellow and white figures appeared in the skies over New York City. The advertiser, R H Macy & Company, did not reveal its name until the following day in a second message.

Working in close cooperation with Skywriting Corporation of America, American Cyanamid Company's Calco Chemical Division developed this new application for its Oil Yellow dye, which up to now has been used primarily in adding color to gasoline and wood stains.

Flying at an altitude of from 10 to 12 thousand feet, a pair of Army training planes, one writing in yellow smoke and the other in white, spelled out a colorful message in letters upside down and backwards one mile high. The second day's message was written by a single plane, all in yellow letters. Color was supplied by flushing oil and Calco's Oil Yellow dye through the plane's exhaust manifold, it is learned.

Another Calco dye, Oil Scarlet, has also been successfully tested for this purpose, it is reported. These developments, it is believed, may pave the way for use of fluorescent colors in sky writing.

Nearly 7,000 Du Pont Company employees occupy the two large headquarters office buildings in Wilmington, Delaware. For more than a hundred years, small offices were maintained on Brandywine Creek, close by the powder mills. The first unit of the Du Pont Building, left center, was completed in 1907. Since then, four additions to this building have been completed, and the Nemours Building, right center, has been built. A third office building is nearing completion near Newark, Delaware, 13 miles from Wilmington.

A recently completed $30,000,000 expansion program makes Du Pont's Experimental Station in Wilmington one of the largest research laboratories in American history, housing nearly half of the Company's research personnel.

During the expansion, nine new laboratory buildings and eleven new service buildings were erected. In addition, two buildings were substantially enlarged and a clubhouse for employees was made into a cafeteria. Most of the new construction was in the open area near the top of this picture. The older section of the Station borders historic Brandywine Creek near where the Company started in business in 1802.

• Du Pont Today

Ceremonies on July 18th, which included a simple historical dramatic prologue, served as the focal point of observances by the Du Pont Company of their 150th anniversary. (See page 402 of the June 23rd issue).

From very modest beginnings the Company has grown to a point where today it is made up of hundreds of thousands of people. Its employees, who numbered a few score 150 years ago, now comprise 87,000 men and women; its shareholders have grown from six to more than 140,000; its customers now exceed 75,000 and its suppliers 30,000, most of them small concerns.

Once the manufacturer of a single item, black powder, Du Pont now makes some 1,200 different products and product lines in 71 plants in communities scattered through 25 states, with almost a third of the company's sales going to the textile industry. Although the country's largest chemical manufacturer, Du Pont reportedly has only eight per cent of the chemicals and allied products business. Du Pont claims to have more than 10,000 competitors and to compete with from one to fifteen major producers in virtually all of the product lines that make up most of its business.

The company's operating investment, which is said to be about $1½ billion, represents an investment of around $18,000 for each employee. Employee benefits, which reportedly total more than $60 million annually, include pensions, vacations with pay, aid in time of illness, hospitalization costs, and life insurance. As the result of a highly organized safety program, employees are "safer at work than they are at home", the Company points out.

Five thousand of the company's employees, technical and nontechnical, staff its 38 research and development laboratories from which new products, new processes and new developments are being constantly brought forth. Within recent years about half of Du Pont's sales have been in products that were unknown, or in their commercial infancy, 20 years previously. Among the latest are "Dacron" polyester fiber and tough "Mylar" polyester film. In 1951, the company is said to have spent $47 million on research. Current spending is estimated to be well over $100 million on new plants and improvements to old ones.

A technically skilled organization, Du Pont carried out many important war jobs for the government in World War II and is now building the gigantic Savannah River Works for the Atomic Energy Commisison, reportedly for a fee of one dollar.

• Hooker Subsidiary Formed in Canada

Formation of a new Hooker subsidiary, Hooker Chemicals, Limited, a British Columbia corporation, has been announced by R L Murray, president of Hooker Electrochemical Company, Niagara Falls, N Y. The new company is acquiring a plant site of approximately 60 acres on Burrard Inlet in the District of North Vancouver, B C, it is reported, with rights to lease adjacent tidelands with about 1000 feet on the channel providing deep water transportation for raw materials and finished products. No definite plans have been made as to date or details of construction of this plant.

Among factors reported as affecting selection of this site are the availability of low cost hydroelectric power, excellent transportation and general facilities and services available for operating a modern chemical plant.

Officers of Hooker Chemicals, Ltd, will be R L Murray, president; B Klaussen, vice president; A Wilcox II, secretary; and D A Riordan, treasurer; all executives of Hooker Electrochemical Company. The board of directors will be: R L Murray, B Klaussen, R W Hooker, J H Babcock, and A Wilcox II, all of Niagara Falls, N Y; A H Hooker of Tacoma, Wash; and R A C Douglas of the Vancouver, B C, law firm of Douglas, Symes and Bissenden.

Hooker Electrochemical Company manufactures more than 100 industrial chemicals in its existing plants at Niagara Falls, New York; Tacoma, Washington; and Ashtabula, Ohio. Additional chlorine, caustic soda and ammonia capacity is being installed at the Tacoma, Washington plant and a large new Hooker plant is now under construction at Montague, Michigan.

• Textile Processing Material Gets Luxury Travel Treatment

Textile processors are turning out many superior materials these days, using the new microcrystalline wax for sizing, waterproofing, and finishing. As compared with paraffin wax, this new material is said to be much smoother, tougher and more flexible, due to its smaller crystals. But while it is a boon to textile people, it can be a headache to those who transport it.

Recently 300,000 gallons of this new microcrystalline wax got "luxury" treatment from research engineers of L Sonneborn Sons, Inc, when it was proposed to barge it along the Mississippi and Ohio rivers, 2200 miles between the gulf coast and Sonneborn's Daugherty Refinery at Petrolia, Pa. Skeptics said it couldn't be done, since liquid wax "freezes" solid, even in torrid weather, unless it is kept at a temperature above 165°F. So a new transportation method had to be evolved, with coils for live steam installed in the barge tanks, to keep the wax "on its good behavior".

When it arrived three weeks later, it was pumped, still in hot liquid form, into similarly heated tank wagons for further transport.

• Delegates to Canadian Seminar Hear 30 Papers

About 500 delegates attending the recent 3-day seminar at Queen's University, under the auspices of the Textile Technical Federation of Canada, heard papers by 30 leading research scientists and industrial technicians.

R N Bateman, a 1951 graduate of the Provincial Institute for Textiles and currently an employee of the Textile Chemical Division of Atlas Powder Company, Brantford, Ont, was presented a check for $100 by George B Kimpton of the Wool Bureau, Inc, for his prize-winning paper "A Ccmprehensive Survey of Shrinkproofing Methods". The contest was open to students of the Provincial Institute of Textiles and St Hyacinth Textile School, St Hyacinth, Que.

G W Graham, research chemist at the Central Research Laboratories CIL, McMasterville, Que, told the delegates that static electricity which causes textile manufacturers a great deal of trouble and expense was due to contact between metal and fiber, rather than, as is generally believed, to friction between textile fibers. This important finding was "a major conclusion" of recent research by himself and his colleagues, Mr Graham said.

E A W Boyce, chemist of the Magog Print Works of Dominion Textile Company Limited, called for a campaign to educate consumers and retail sales personnel in the properties and uses of textiles, particularly the new man-made fibers. He said that the average housewife relied mainly on the advice of sales personnel in buying textiles and clothing and if the sales person did not know how the material would react under various conditions "a very dangerous situation is created".

J R Winfield of Imperial Chemical Industries, England, described the development of Dacron polyester fiber into a textile fiber. He said the wearing and stain-resistant properties of the new material were such as to promise revolutionary changes in the clothing industry.

General chairman of this third seminar was Fred J Knight, president, Hubbard Felt Co Ltd, Montreal.

The General Seminar Committee of the Federation comprises Mr Knight, Dr C E Coke, Courtaulds (Canada) Ltd, Montreal; Dr L J Sheps, Trilon Chemical Ltd, Montreal; and H C Mersereau, nylon division, Canadian Industries Limited, Kingston.

Reception committee chairman was A Harold Miller, Scholler Bros, Ltd, St Catherines; registration committee chairman—George Holloway, Dye & Chemical Co of Canada Ltd, Kingston; film exhibition committee chairman — R B Weatherston, Sandoz Chemical Works Ltd, Toronto; publications committee chairman—William King, *Canadian Textile Journal,* Montreal.

• Sterling Agency to Handle Publicity of TOA

The Industrial Division of Sterling Advertising Agency, New York, has been appointed by the Tall Oil Association, also of New York, to handle its publicity and public relations program.

The Association is composed of thirteen of the fourteen manufacturers and sellers of Tall Oil, a mixture of rosin acids and of unsaturated 18-carbon fatty acids.

Among the members of the Tall Oil Association are:

Albemarle Paper Manufacturing Company, Richmond, Va
Arizona Chemical Company, New York, N Y
Brunswick Pulp & Paper Company, Brunswick, Ga
Camp Manufacturing Company, New York, N Y
Champion Paper & Fiber Company, Canton, N C
Continental Can Company, Hopewell, Va
Gaylord Container Corporation, St Louis, Mo
National Southern Products Corp, Tuscaloosa, Ala
Newport Industries, Inc, New York, N Y
North Carolina Pulp Company, Camden, N J
Southern Advanced Bag & Paper Company, Hodge, La
Union Bag & Paper Corp, New York, N Y
West Virginia Pulp & Paper Company, New York, N Y

Technical bulletins on tall oil and its uses are available upon written request to the Tall Oil Association.

• Use of Saran in Decorative Fabrics and Carpets Highlighted

Members of the press were introduced to the application of Saran fibers for decorative fabrics and carpets at a showing on September 16th at the Waldorf-Astoria, New York.

The showing was featured by Dr Roy K Marshall's practical demonstration of a number of the qualities of Saran—its nonflammability, its resistance to stains from ink and acids, and its waterproof qualities. Its unusual strength and toughness, as well as its resilience, was demonstrated by a model who stood on a piece of Saran window screening on a horizontal rack.

On display were many lengths of new upholstery fabrics, drapery fabrics, and several types of carpeting, including the "100 per cent" fabrics as well as blends. The decorative fabrics represented a number of beautiful effects, including textured surfaces gained by the use of different weaves. The color range in both the carpets and decorative fabrics was particularly rich and effective.

Another application of Saran yarns is in doll wigs. It is reported that about 85 per cent of that business now goes to Saran. Other new uses, still in the experimental stage were shown, together with the original applications of Saran monofilaments in seat cover materials, webbing for outdoor furniture, luggage covering, and window screen cloth.

Technically Saran is a copolymer of vinylidene chloride and vinyl chloride, made from the basic raw materials, petroleum and brine. It has been produced by The Dow Chemical Company since 1939. Earlier uses for Saran were in the heavier monofilaments where they have won for themselves consumer acceptance in automobile seat covers, outdoor furniture, luggage covering, window screening and the like, as well as in many industrial applications.

In the finer denier The Saran Yarns Company now is producing monofilaments in 70 and 100 denier, multifilaments, and tow. Saran also is produced in three staple fiber forms—straight, crimped and curled.

• ICS Announces New Textile Courses

A group of eight new home study courses for personnel of the textile industry has been developed by the International Correspondence Schools, Scranton, Pa, according to an announcement by Dean John C Villaume. Included in the group is a unit for finishing and dyeing technicians.

• Alexander Smith to Revise Yonkers Layout

Details of the recently announced plans of Alexander Smith, Inc to realigned production facilities of their big carpet plant in Yonkers, N Y, appear to be developing well. The plans have been under development for the past two years as part of a broad program to strengthen the Company's operations.

The present plant is big and sprawling, having grown up over the past 80 years to the point where it is now a half mile long and contains 56 acres of floor space.

According to W F C Ewing, president, the company plans a thorough revision of the plant layout in order to make it competitive with other carpet mills and to provide substantially improved working conditions. These plans call for a consolidation of production facilities in the central area of the plant which will permit a much shorter production line and greatly reduced materials handling.

At present the plant area covers approximately 2,600,000 square feet of which about 800,000 square feet are in buildings or land which are no longer put to any productive use. After realignment, the company expects to concentrate facilities in the remaining 1,800,000 square feet. It is estimated that two years will be required to carry out the realignment without serious interruption of production or idleness to employees. It is estimated that the cost of the operation will be largely offset by income from the sale of the excess land and buildings.

The capacity of the plant will be about the same as that now available for the production of broadloom carpets and rugs.

Mr Ewing stated that production facilities in Yonkers are being worked out in relationship to those scheduled for the company's new and completely modern carpet mill in Greenville, Mississippi. Construction of this mill is being pushed as rapidly as possible in order that production may be started there early next year.

• TAPPI Articles Discuss Dye Adsorption on Wood Pulp

Results of over two years of research have been reported by Professors John W Beamesderfer, Edward F Thode and Andrew J Chase of the University of Maine in *TAPPI* magazine, the official publication of the Technical Association of the Pulp and Paper Industry, under the title "Dye Adsorption on Wood Pulp".

This report by the University staff members is in two parts: the first, subtitled "Adsorption of Direct Dye on Unbeaten Sulfite Pulp", was prepared in collaboration with Roswell E Hubbard, Jr of Waterford and Framingham, Mass, a former research fellow at the university. The second part is subtitled "Relation of Dye Adsorption to the Physical Properties of Beaten Sulfite Pulp".

According to Dr Beamesderfer, who is head of the department of chemistry at the University of Maine, the problem being investigated is unique in that only surface coverage of the wood pulp fibers is being attempted; in ordinary dyeing, complete permeation of the fibers is ordinarily desired. The reported object in performing this limited dyeing is to obtain fundamental information concerning fiber surfaces.

Possible applications to the pulp and paper industry are envisaged by Dr Thode, an associate professor in the university's department of chemical engineering.

"While this word is strictly what is referred to as fundamental research," Dr Thode said, "our results so far have definitely shown that dye adsorption is directly related to the strength properties of finished paper. We hope that our future work will yield information concerning the properties of fiber surfaces that will be of use to the industry in controlling paper quality".

• Zurn Named Chairman of PTI Board of Governors

Frank P Zurn, Alco-Zander Company, Philadelphia, has been elected Chairman and Richard B Stehle, Brehm & Stehle, Philadelphia, Vice Chairman of the Board of Governors of the Philadelphia Textile Institute, according to an announcement by Rinaldo A Lukens, PTI President.

Committees and members as elected at the organization meeting of the Institute's Board of Governors are listed below:

Executive Committee

Chairman—Richard B Stehle, Brehm & Stehle
J Marshall Cole, Cold Spring Bleachery
Frederic H Barth, Industrial Rubber Company
William T Galey, 3rd, Aberfoyle Manufacturing Co
Howard P Galloway, Alumni Assn of PTI
Edwin G Michie, Andrew Y Michie and Sons
William I Kent, Kent Manufacturing Co
Joseph A Schmitz, Universal Dye Works

Faculty and Curriculum Committee

Chairman—Frederic H Barth, Industrial Rubber Co
J Marshall Cole, Cold Spring Bleachery
Clarence L Ederer, Ederer, Inc
M Earl Heard, West Point Manufacturing Co
Edgar Schlesinger, United Merchants and Mfrs

Student Affairs Committee

Chairman—Edwin G Michie, Andrew Y Michie and Son
Leon P Brick, Onyx Oil and Chemical Co
William T Galey, 3rd, Aberfoyle Manufacturing Co

Equipment and Building Committee

Chairman—Joseph Schmitz, Jr, Universal Dye Works, Inc
William I Kent, Kent Manufacturing Co
Horace T Greenwood, Globe Dye Works Co
William J Maurer, F W Maurer and Sons Co

Publicity and Public Relations Committee

Chairman—Howard P Galloway, Alumni Assn of PTI
Edwin I Dale
Carl C Mattmann, Jr

Research Committee

Chairman—Richard B Stehle, Brehm and Stehle
Robert A Ramsdell, Du Pont Textile Fibers Dept
William I Kent, Kent Manufacturing Co

• GPA Establishes Research Awards

The Glycerine Producers' Association has announced the establishment of a group of awards for outstanding research in the application of glycerine or glycerine derivatives. The awards to be given will consist of an honor plaque carrying a cash stipend of $1,000, and two honor certificates carrying stipends of $300 and $200 respectively, it is learned.

In announcing the awards, E Scott Pattison, Manager of the Glycerine Producers' Association, pointed out that glycerine is a widely applied material employed both as a chemical intermediate and in mixtures for its physical properties. The awards, he stated, were established for the purpose of acknowledging and encouraging research which advances still further the uses for glycerine and its derivatives in any product or process for industrial or consumer use.

As outlined by the Association, research work eligible for nomination may be concerned with chemical, physical, or physiological properties of glycerine, or with properties of glycerine-containing or glycerine derived materials. The work may deal with applications which of themselves are currently or potentially of value to industry or the general public, or with scientific principles or procedures likely to stimulate future application. The Association emphasized that originality in extending the application of glycerine into new fields of usefulness will receive special consideration.

Work which has been successfully concluded or which has reached a clear-cut point of accomplishment during the current year will receive first consideration for the awards. Work carried on in previous years, but which has become significant commercially in 1952, will also be eligible.

• 40th National Safety Congress

Hundreds of safety engineers from the nation's chemical industries were among the 12,000 accident prevention specialists attending the 40th National Safety Congress and Exposition in Chicago, October 20-24.

The high point of the chemical sessions at this Congress, which marked the 40th anniversary of organized safety, was a symposium Tuesday afternoon on safety in chemical plant maintenance. Speakers, one for each department concerned with maintenance work, covered the special hazards of keeping a plant in operation.

• Berkshire Chemicals Acquires Innis, Speiden

International Minerals & Chemical Corporation has sold the name of Innis, Speiden & Company, Inc and its resale chemical business to Berkshire Chemicals, Inc of New York, according to an announcement by A Norman Into, vice president in charge of International's Potash Division.

In making the announcement on October 15th, Mr Into explained that when International bought Innis, Speiden in July, 1951, its major purpose was to acquire the electrolytic plant and facilities at Niagara Falls, New York, enabling International to follow its main objective of expanding vertically production of potassium chemicals. In that way chemical products could be taken from International's mines and put into finished form for industrial consumers.

"The other parts of Innis, Speiden, consisting of a gum and wax business with a plant at Jersey City, an insecticide business and a general resale chemical business, did not follow along the growth lines or type of business conducted by International Minerals & Chemical Corporation.

"During the past several months, therefore," Mr Into stated, "International has been divesting itself of these unrelated activities of Innis, Speiden. The final sale of the last of the assets of Innis, Speiden to Berkshire Chemicals, Inc leaves International with the prime and original part of the business which International desired; namely, the electrolytic plant at Niagara Falls, which has been made a part of the Potash Division."

Innis, Speiden's wax and gum business has been sold to Morningstar, Nicol, Inc of New York, and the insecticide segment has been purchased by a group of former employees of Innis, Speiden who call their company Lavarcide Products, Inc. International will continue to make at Niagara Falls certain of the insecticide products for Lavarcide Products, Inc, it was disclosed.

Mr Into added that International Minerals plans to spend more than one million dollars at the Niagara Falls plant for improvements which will increase production of chemicals and chlorine products by about 25 per cent.

• Clearing House for Dyestuff Intermediates

A new company, Organic Intermediates, has recently been formed to serve as a clearing house for the sale of dyestuff intermediates manufactured by the smaller dyestuff concerns. Organic Intermediates will also act as sales agent for chlorophyll and derivatives manufactured by the Chlorophyll Corporation of America, it is learned.

Most dyestuff producers manufacture one or more of the intermediates used in the preparation of their dyes, but usually the smaller concerns do not offer them for sale due to lack of the proper marketing organization. Organic Intermediates is said to fill the need of these companies for a sales group that is familiar with the distribution pattern for dyestuff intermediates. The products offered by the new company represent the output of some thirty-odd manufacturers, and some of the materials are on the market for the first time.

A list of the intermediates handled is available by writing or wiring Organic Intermediates, 120 Central Avenue, Clark Township (Rahway), New Jersey.

• Bangor Mills Pension Plan Lists New Benefits

George H Korn, Vice-President of Bangor Mills, Inc, Pen Argyl and Bangor, Pa, recently announced a new high in benefits to employees under the Bangor Mills Pension Plan, as well as the addition of many additional employees to the Plan.

Bangor Mills has reportedly contributed over $250,000, with no contributions from its employees. Employees are also covered by death benefits totalling approximately $1,000,000 under the Plan, it is reported.

The Irving Trust Company of New York is Trustee, holding all the pension policies purchased by the funds contributed by the company.

The Plan is administered by a Pension Committee, consisting of: Meyer H Korn, *president,* J Lawrence Davis, *attorney,* Albert J McMasters, *Office Manager,* Ellisworth M Davies, *Finishing Dept Superintendent,* and Charles H Weiss, American Profit Sharing and Pension Planning Co.

• New Ellen H Richards Institute Director Named

Mary P Shelton, for the past seven years associate professor of textiles and clothing in the College of Home Economics at the University of Tennessee, has been named director of the Ellen H Richards Institute at the Pennsylvania State College, succeeding Dr Pauline Beery Mack.

In announcing the appointment of Miss Shelton, Dr Milton S Eisenhower, president of the College, also explained that the Institute would become a part of the School of Home Economics at Penn State.

The Institute was established at Penn State in 1941 to conduct research concerned with food, clothing, and shelter and during the past 11 years under the direction of Dr Mack, now dean of the College of Household Arts and Sciences, Texas College for Women, Denton, Texas, became internationally known. It was named for Ellen H Richards, the first woman to receive a degree in chemistry from Massachusetts Institute of Technology and a founder of household science in its modern sense in this country.

Explaining the new organization for the Institute, Dr Grace M Henderson, dean of the School of Home Economics at Penn State, said that the Institute will become a part of the department of clothing and textiles and its research activities will be concentrated in the clothing and textiles field.

Activities in human nutrition will be combined with similar research in the department of foods and nutrition, and work in home equipment, also a part of the Institute program, will be transferred to the department of home management, housing, and art. Bone density research will be continued in the School of Chemistry and Physics.

Miss Shelton also headed the program of research in textile chemistry at the University of Tennessee. From 1941 to 1944, she was employed by the Ciba Co, Inc, doing research in the development of finishes, detergents, and dyes in relation to new fabrics and in relation to fabric construction. Prior to going to the University of Tennessee, she was a research associate with the American Association of Textile Chemists and Colorists and presently holds a fellowship in chemical research from the Celanese Corp.

• William Carter Company Adopts New Training Program

A special training program for young men of promise has been adopted by The William Carter Company which will cover 18 months' roving apprenticeships, broken into assignments of varying duration in specific departments. General office background will be given trainees assigned to the order, shipping, credit, general accounting, cost accounting, tabulating and purchasing departments.

So that first-hand information may be obtained in the technical aspects of the company's operation, trainees will work in production and planning, and the three major merchandise divisions. On-the-spot production training will be given at Carter's Springfield, Mass, and Barnesville, Ga, plants.

Trainees will also serve "apprenticeship" in the sales division at the home office at Needham Heights and in the company's Boston sales office, as well as in

the company's advertising and promotion divisions.

One of the first "students" for the new program is Manson Carter, who has been with the company for the past year and a half. He is the grandson of Horace A Carter, executive vice president and treasurer.

• Sylvan I Stroock Scholarship Fund of $10,000 Established

The establishment of the Sylvan I Stroock Scholarship Fund, in memory of the late Sylvan I Stroock, for the benefit of men and women students of Lowell Textile Institute and the Philadelphia Textile Institute, was announced last month by Elsie M Murphy, President of S Stroock & Co, Inc.

The $10,000 fund will be divided equally between the Lowell Textile Institute and the Philadelphia Textile Institute, and the scholarships will be offered annually to such students as may be selected by the respective Institutes' Faculty Scholarship Committees.

Each Institute has the option of awarding their share of the fund in the form of one $500 scholarship a year, or two $250 scholarships each year, for a period of 10 years.

Student recipients will be selected on the basis of scholarship record, personality, demonstrated ability in leadership, participation in extra-curricular activities, promise of success in textile fields, and financial need. Announcements of the scholarship winners will be made, annually, at a suitable time and place appointed by the presidents of the respective Institutes.

• Salt-Free Sulfonates

Ninol Laboratories, Chicago, Ill, began production of a line of sulfonated detergents recently, using an important new sulfonating technique.

Unique feature of the new process is the employment of liquefied sulfur trioxide as a sulfonating agent in place of the conventional oleum. Reportedly the first detergent manufacturer in the U S to use this process, Ninol claims it makes possible the production of salt-free sulfonates at economical price levels.

Using standard sulfonating methods it has hitherto been difficult to produce detergents containing less than 15% salt contamination. The new sulfur trioxide method is said to yield products containing less than 0.1% salts. Better solubility in either water or oil, and greater stability of many formulations, such as cosmetic emulsions, are said to result.

Already in production are Ninex 21 (a foam-stabilized liquid detergent) and Toximul (anionic agricultural emulsifier). Contemplated are a variety of special products such as nonfoaming detergents, all purpose emulsifiers and lube oil additives.

A new plant now under construction in Chicago will reportedly have a projected capacity of approximately ten million pounds.

• Increased Carbose Facilities

New facilities for the production of Carbose* have been placed in operation by Wyandotte Chemicals Corporation, Wyandotte, Mich, that will make available commercial quantities of new grades of Carbose for specialized consumer applications . . . forms obtainable heretofore only in experimental amounts.

Among the advantages brought about by this recent installation are increased detergency promotion and greater whiteness retention. One of the new grades, Carbose VL, is said to possess the lowest viscosity of any sodium carboxymethylcellulose on the market. Another, Carbose LS, does not scorch at the high temperatures common in ironing, providing excellent softness of finish and retention of shape on wearing without uncomfortable stiffening of the fabric, it is reported.

A new 40-page booklet, describing the current Carbose series in detail, is available on request from Wyandotte Chemicals.

* Trade name for Wyandotte's sodium carboxymethylcellulose products.

NAMES IN THE NEWS

BERKSHIRE Color & Chemical Company, Delawanna, N J, has announced that JOHN H HENNESSEY has joined them in the capacity of Vice President.

A graduate of Philadelphia Textile Institute (Class of 1922), Mr Hennessey has had a long and varied career in the dyestuff industry.

He spent 29 years with the General Dyestuff Corporation, starting out in sales in Philadelphia, Pa and Charlotte, N C. He has been located in GDC's New York technical department for the past 26 years, the last 13 of which he was in charge of the Vat Colors Department.

During World War II, Mr Hennessey spent 16 months with the War Production Board as Chief of the Cotton Finishing Section.

Most recently he assisted Donald E Marnon in the development of the Marhen Process for Vat Dyeing.

Very active in AATCC activities, Mr Hennessey has been on the Committee for the OD7 Project, in cooperation with the Quartermaster Corps, for two years.

J H Hennessey

He is also associate editor of the AATCC's "Vat Monograph", which is currently in preparation. He is now serving as Vice Chairman of the New York Section, having served the Section previously in the capacity of Treasurer.

In his new position, Mr Hennessey has among his duties the direction of new product development.

DR MAX Y SEATON has been named senior Vice-President and Technical Co-ordinator of the Chemical Divisions of Food Machinery and Chemical Corporation, according to an announcement by Paul L Davies, President, on October 16th. FMC Chemical Divisions include Westvaco Chemical Division, Niagara Chemical Division, Ohio-Apex Division, and Buffalo Electrochemical Company.

Formerly Executive Vice-President of Westvaco Chemical Division, Dr Seaton will maintain his office in the Chrysler Building East, New York, N Y, where the newly-created Eastern Administrative Headquarters of all FMC chemical operations are located.

The position of Executive Vice-President of the Westvaco Chemical Division has been discontinued and WILLIAM B THOM, president of Westvaco, and WILLIAM N WILLIAMS, Operating Vice-President of Westvaco, will assume the responsibility for the former activities of this office.

J J Prichett

H H Gilmann

R E Vicklund

JOHN J PRICHETT has been named associate director of chemical research of The Hilton-Davis Chemical Co Division of Sterling Drug Inc, according to James F Thompson, vice-president and general manager. Mr Prichett will work with DR DONALD H HIRTLE, research director, in the development of dyestuffs and intermediates.

A chemist and chemical engineer for the last 18 years, Mr Prichett was previously associated with Hilton-Davis from 1937 to 1948 and was also a chemist at the General Aniline Works Division of General Aniline and Film Corporation, and the National Aniline Division of Allied Chemical and Dye Corporation. He was also on the staff of A M Kinney, consulting engineers.

CONSUELO HOUSEWORTH KUHN has joined the staff of The House of J Hayden Twiss as a chemical advertising copywriter. Miss Kuhn was previously with Merck & Co, as an analytical chemist. The House of J Hayden Twiss, an industrial advertising agency, specializes in chemical and allied accounts. Miss Kuhn will also be available to all clients for product and market research and development work.

C H Kuhn

FEDERAL RESINOUS CHEMICALS, INC, Brooklyn, N Y, has announced the election of DR HENRY H GILMANN as president. The Federal Resinous Chemicals, Inc, specializes in the production of textile processing chemicals such as synthetic resins, detergents, finishes, etc.

DAN RIVER MILLS announced on October 16th the promotion of two executives and the realignment of several departments which formerly reported to BASIL D BROWDER, who recently was made Executive Vice President. The realignment will enable Mr Browder to devote more time to his new responsibilities, it is pointed out.

L K FITZGERALD, formerly Director of Research and Development, has been promoted to the newly-created post of Coordinator of Merchandising and Manufacturing. In addition to the responsibilities of this position, he will have under his direction three departments which previously reported to Mr Browder. These include the Production Control Department headed by L M THOMPSON, the Quality Control Department headed by W L CLEMENT, and the Customer Contact Department headed by W J ADAMS.

DR H Y JENNINGS, who formerly served as Director of Research under Mr Fitzgerald, has been elevated to the post of Director of Research and Development, and will be in charge of the company's research laboratories and pilot plant.

Two departments have been added to those already under the direction of A B EMMERT, vice-president. These include the Purchasing Department headed by C M VERNON, Director of Purchases, and the Transportation Department headed by CARL T HESTER, JR, Traffic Manager. These men formerly reported to Mr Browder.

D A OVERBEY, JR, Supervisor of Office Services, will in the future report to E J MACK, Comptroller.

ER DURRER, Executive Vice President, has announced the appointment of R E VICKLUND as Manager of Sales and Development for Sindar Corporation.

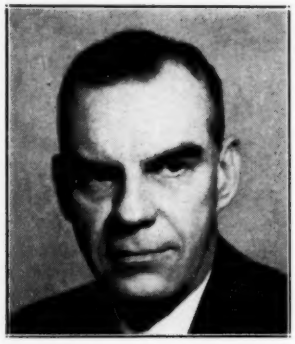
Mr Vicklund joined the Sindar Corporation in 1950 as a technical representative. Immediately prior to this appointment, he was Chief of the Fungus Control Section of Engineer Research and Development Laboratories, where he supervised the development and research program on the deterioration and preservation of textiles, paints, rubber, plastics, and other materials.

COLLOIDS, INC, Newark, N J, manufacturers of processing chemicals, have announced the appointment of HARLAN C PRUETT as general manager of Colloids of Carolina, Inc, High Point, N C.

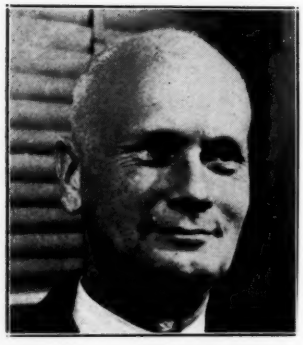
Since 1950 Mr Pruett has been associated with Textron Southern, Inc as Division Manager of the Williamston, Hartwell, Honea Path Division.

Prior to joining Textron Southern, Inc, Mr Pruett held managerial positions with Burlington Mills Corp and Frank Ix & Sons.

H C Pruett



F A Gibbons



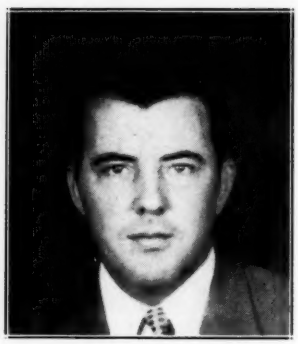
J Hilldring

AT THE October meeting of the Board of Directors of General Aniline and Film Corporation, FRANCIS A GIBBONS was elected Vice President and Treasurer, and JOHN HILLDRING, Vice President in charge of Foreign Operations.

Mr Gibbons, who has been with General Aniline for the past 23 years, has served as treasurer since June 1951. He had previously been secretary of the Company.

Mr Hilldring has been General Manager of Foreign Operations since joining the Company in 1947. He also serves in the same capacity for General Dyestuff Corporation, sales outlet for GAF dyes, chemicals and other products. Commanding General of the 84th Infantry in World War II, Mr Hilldring served as Assistant Secretary of State in 1946 and 1947, and was in charge of policy with respect to all occupied areas. He was named an Alternate United States Delegate of the United Nations General Assembly in 1947, and served similarly at the Far Eastern Commission.

GEORGE GALLOWHUR, president of Gallowhur Chemical Company, New York, N Y, has announced the appointment of JOHN GERACI as plant manager at Ossining, New York. Mr Geraci was formerly assistant technical director of Sterone Corporation.



S H Huffstetler

SAMUEL H HUFFSTETLER has recently joined the firm of Parrott & Ballentine, Greenville, S C, Manufacturer's Agents for Smith, Drum & Company, Van Vlaanderen Machine Company, H Brinton Company, and Haskel-Dawes Machine Company.

Until Mr Huffstetler joined the firm of Parrott & Ballentine, he was employed by the Burlington Mills Corporation, Alta Vista, Virginia. Mr Huffstetler will make his headquarters at 932 Hill Street, Greensboro, North Carolina.

R E Horsey

ER DURRER, Executive Vice President, has announced the appointment of R E HORSEY as Vice President in Charge of Sales for Givaudan-Delawanna, Inc and its affiliate, Sindar Corporation. This appointment will consolidate the sales management of both companies, it is reported.

Mr Horsey joined the Givaudan organization in 1943 as the manager of its Industrial Products Division. When, in 1948, the sales functions of this division were absorbed by Sindar Corporation, a newly formed associate company, Mr Horsey was appointed Sales Manager.

A O Jaeger

DR ALPHONS OTTO JAEGER, Chairman of the Development Committee and Director of the General Technical Department of the American Cyanamid Company, has been named a Pennsylvania Ambassador by the Pennsylvania State Chamber of Commerce. Dr Jaeger, founder of the Bridgeville plant of the Selden Division of American Cyanamid, accepted the Ambassador Award on October 16th at a banquet given in his honor by the Bridgeville Chamber of Commerce.

The Pennsylvania State Chamber of Commerce annually sponsors the selection of a number of former residents of the Commonwealth who have distinguished themselves in varied fields and brought credit and renown to the state. Dr Jaeger, who was nominated by the Bridgeville Chamber of Commerce in conjunction with the recently observed "Pennsylvania Week", is among 25 named from a list of 87 nominees.

R Hutchinson

RUSSELL HUTCHINSON has been named to the sales staff of Emkay Chemical Company, Elizabeth, N J.

Since his discharge from the Armed Forces, Mr Hutchinson has been with Hudson Piece Dye Works and Warwick Chemical Company, Division of Sun Chemical Co.

THE following promotions in the Michigan Alkali Division, Wyandotte Chemicals Corp, became effective on October 1st: R C LEONARD to product manager—Caustic Soda and Chlorine; P M BIGLEY to product manager—Soda Ash, Dry Ice and Bicarbonate of Soda; R K RIGGER to product manager—Synthetic Detergents; T R BOYLE to administrative assistant to the vice president—Michigan Alkali division. These men will be located at Wyandotte.

Mr Leonard has been sales representative in Wyandotte's Detroit office for the last five years. In his new position he will be in charge of Caustic Soda and Chlorine sales.

Mr Bigley will be responsible for sales, plans and programs related to Soda Ash, Dry Ice and Bicarbonate of Soda. He is a veteran Wyandotte employee with over 35 years of service, ten of them in an executive selling capacity.

Mr Rigger will manage the newly created department of Synthetic Detergents. Formerly assistant manager of the Organic Chemicals department, Mr Rigger has been a member of the Wyandotte sales team since 1948.

Mr Boyle will carry out special duties as assigned by the vice president of the division and will also function as office manager. Mr Boyle, with Wyandotte for 9 years, was formerly administrative assistant to the general sales manager.

G L GLESPEN, who held the post of Chief of Chemicals, Containers and Packaging Branch of the Petroleum Administration for Defense, Materials Division during a ten months' leave of absence from American Cyanamid Company, has returned to the firm's New York Office as Assistant to the Manager of the Petroleum Chemicals Department. Before leaving for his P A D assignment, Mr Glespen was Technical Supervisor in the same department.

EXECUTIVES of the Florence Thread Company of Riverside, New Jersey, recently announced the appointment of A BENTON JONES, of Newtown Square, Pa, to the Florence Sales Staff.

Mr Jones' experience in the industry includes five years—from 1942 through 1947—as a Buyer in the Purchasing Department of the Collins & Aikman Corporation. From 1948 through 1951, he had charge of the Philadelphia Office of Chester S Brett, Inc, Wool Merchants, of Boston, Mass.

Assigned to Southern New Jersey Pennsylvania and Delaware, Mr Jones will represent Florence in these areas for both custom yarn dyeing and the sale of dyed yarns for knitting and weaving.

R C Leonard

P M Bigley

R K Rigger

T R Boyle

DUNCAN J MacLENNAN has been appointed New England sales representative for the plasticizer division of Pittsburgh Coke & Chemical Company, with headquarters at 79 Knollwood Road, West Hartford, Connecticut.

Mr MacLennan formerly was sales research and planning manager for Whitney Chain Company, Hartford, Conn. Earlier he was with the Godfrey L Cabot Company, Inc, of Boston, Mass.

KARL M HERSTEIN, Chairman of the New York Chapter of the American Institute of Chemists and president of the consulting organization bearing his name, announced on October 15th that SAVERY F CONEYBEAR, Vice President of Evans Research and Development Corporation has been elected Vice-Chairman and RICHARD L MOORE, Assistant Treasurer of Foster D Snell, Inc, has been elected Secretary-Treasurer of the New York Chapter.

Mr Coneybear succeeds GUY A KIRTON, who has recently been appointed Assistant Sales Manager of the Chemical Sales Division of Tennessee Eastman's Kingsport plant. Mr Moore fills the unexpired term of JOHN H SANDERS also of Tennessee Eastman, who has been appointed Technical Representative of the Chemical Sales Division in charge of their Cleveland office.

R E WILKIN, general sales manager, Hooker Electrochemical Company, has announced the appointment of WILLIAM L GILLESPIE as field salesman for Chicago and the Midwest area. Mr Gillespie has been with the Hooker Company since 1939, having been in the development and research department in various capacities until 1950. Prior to his recent transfer, he had been in the sales department on technical service.

At the same time HAROLD WEVER was transferred to technical sales service. Mr Wever has been at Hooker since 1943 and had been in the development and research department of the company prior to his recent transfer.

Other technical people employed recently by Hooker include the following:

DONALD J STONE has been hired as a mechanical engineer.

EDWARD A HUTTON has been employed as a chemical engineer in the process study group.

ALICE M FULTON has been employed as a librarian in development and research.

ROBERT H PUGH has been hired as a chemist in the works laboratory. He has had previous experience in chemical work with National Carbon Company, the Du Pont Company, United States Rubber Reserve and Harshaw Chemical Company.

ROSEMARY E POWELL has been employed as a laboratory technician.

STEIN, HALL & CO, INC, New York, has announced the resignation of OLIVER H CLAPP as Vice President and Director.

ALFRED H MILASK has been appointed Eastern sales manager of Chemical Products Sales for The Atlantic Refining Company and has been transferred to the company's headquarters in Philadelphia. Since 1948 he had been serving as sales representative for Atlantic's Southern territory, operating out of the regional offices in Charlotte, N C.

He is succeeded at Charlotte by WILLARD E SMITH, who joins the company after nine years' experience in chemical research and sales engineering with the textile industry in the South.

OBITUARY

FRED H HAGGERSON, Chairman of the Board of Union Carbide and Carbon Corporation, died at the Roosevelt Hospital, New York, N Y, on October 14th after a short illness. He was 68 years old.

Mr Haggerson, who had been with Union Carbide for over 33 years, became Chairman of the Board in 1951. He had been made Vice-President of the Corporation in 1938, a Director in 1941, and President and a member of the Executive Committee in 1944. His liberal policy of research and expansion has been credited in a large measure for the growth of the Corporation.

FRED H HAGGERSON

TECHNICAL LITERATURE

Clorpactin* CXW for Bleaching and Color Stripping

Guardian Chemical Corp
10-15 — 43rd Avenue
Long Island City 1, N Y
Available on request

The Clorpactins were the result of a research program started about five years ago to produce a chemical composition which would make available not pure chlorine, but hypochlorous acid, an unstable compound known for its powerful oxidizing capacities and which, it was expected, would not affect fibers. The Clorpactins are a line of unusual compositions, comprised of a buffered hypochlorous acid, suitably modified and adjusted. Prolonged chemical tests were made to counteract instability, provide maximum available hypochlorous acid, and to bring down the cost of the product to a point where it would be economically practical.

It is reported that samples of the CXW grade were submitted to dyehouses about two years ago with suggestions for use in stripping and that the dyehouses are still using it. Although much investigation remains to be done, particularly with regard to the newer synthetic fibers and dyes, it is claimed that Clorpactin CXW will strip a wide range of nonfast colors from such fabrics as acetates, rayons and cottons rapidly and easily, with a minimum loss of tensile strength in the material being handled. It is further claimed that over dosing under normal conditions of use does not result in tendering the fabric. The product is said to rapidly oxidize the dye, thus discharging the color and since the action is gentle and buffered to almost the pH of distilled water, the fabric is scarcely affected by the treatment. Fabrics such as acetate and rayon require a 1 to 1½% solution.

The bulletin gives complete instructions for use as a bleaching or stripping agent, as well as suggestions for use in treating process waters or in decreasing the B O D of dyehouse wastes.

* Trade-mark of the Guardian Chemical Corporation covering its line of oxidizing compositions.

Fundamental Studies of Chemical Retardants for the Fire Resistant Treatment of Textiles

PB 111007
Office of Technical Services
U S Dept of Commerce
Washington 25, D C
308 pages, $7.75 mimeograph copy*

The latest technical know-how for fire-retardant treatment of textiles is summarized in this 308-page report, which presents results of a 3-year research project carried on at Columbia University for the Army Quartermaster Corps. It includes a number of fundamental studies into the physical phenomena which occur when cellulosic materials are burned, and the processes by which various chemicals prevent this burning action. This basic knowledge has enabled the textile industry to produce (for the Quartermaster Corps) flame-resistant treated textiles lighter in weight and more flexible than those available during World War II.

OTS has said that, although the results of this research have been published in a general way before, this report presents them in full detail and in such a well organized manner that it should prove valuable to the entire textile industry.

The following studies are reviewed in the report: The Thermal Decomposition of Cellulose and Fire; Pyrosis and Combustion Rate Studies on Flameproofed Fabrics; Rates of Degradation of Flameproofed Fabrics; The Insulation Value of Flameproofed Fabrics to Incident Heat or Flame; Composition of the Tarry Products from the Thermal Decomposition of Cotton; Volatile Decomposition Products from Fabrics and Their Relation to Flameproofing; The Effect of Traces of Fire Retardants on the Inflammability of Cotton Fabrics; The Kinetics of the Oxidation of Carbon as Related to the Afterglow Phenomenon; Chemical and Physical Properties of Flameproofing Agents; Investigation of the Foaming Tendency of Inorganic Mixtures upon Heating as a Possible Physical Mechanism of Flameproofing; Fundamental Aspects of the Urea-Phosphate Fire Retardant System; Fundamental Studies of the Antimony Oxide Organic Chloride Combinations; Exploratory Investigations of Flameproofing Agents.

Among significant findings are these:

(1) Flame rate measurements support the theory that the lower the tar formation on combustion, the greater the resistance of the fabric to flaming.

(2) The greatest efficiency in decreasing the rate and amount of tar formation is exhibited by mixtures of borax and boric acid.

(3) A variation of less than 1 per cent in *add-on* can mean the difference between a fabric which flames and one which does not.

(4) It is evident that the permanency of a given flameproofed fabric is directly related to its permanent ability to produce only slight amounts of tarry combustion products after scouring and extraction processes such as water leaching and detergent laundering.

* Make check or money order out to Treasurer of the United States.